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ABSTRACT

The U.S. Naval Reserve Officer Training Corps (NROTC), offered through host colleges and universities, requires enrolled midshipmen to complete all institutional requirements for the baccalaureate degree in a technical or scientific field or an academic major of interest to the Navy, and to complete specific naval science courses. This study addresses the relationship of technical preparation to performance in post-accession training programs and gives a general assessment of the NROTC program's effectiveness. A management information system was developed to identify, track, and analyze pertinent data. Analyses were done of graduate performance in these follow-on training programs: surface warfare officer, supply corps, submarine officer basic, nuclear power, and aviation. Results showed that graduates performed at a consistently satisfactory level in all programs. Grade averages were well above established pass/fail scores and showed minimal deviation from those of other accession programs. Attrition, setback, correlations with students' technical background, and institutional variables were also considered. Study data are displayed in tables and charts with narration. Appended are NROTC core curriculum requirements, a data elements list by source, and institutional variables and assignment notes. (MSE)

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TRAINING ANALYSIS AND EVALUATION GROUP

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TECHNICAL REPORT 131

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# AN ASSESSMENT OF NAVAL ROTC GRADUATE PERFORMANCE IN POST-ACCESSION TRAINING

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TRAINING ANALYSIS AND EVALUATION GROUP
ORLANDO FLORIDA 32813

Technical Report 131

# AN ASSESSMENT OF NAVAL ROTC GRADUATE PERFORMANCE IN POST-ACCESSION TRAINING

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Training Analysis and Evaluation Group

October 1982

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Recently, considerable attention has been focused on the Naval Reserve Officers Training Corps (NROTC) program and the post-accession performance of its graduates. The NROTC is one of two major programs by which regular officers are commissioned for service in the U.S. Navy.

The NROTC program, offered through host colleges and universities, requires enrolled midshipmen to complete all institutional requirements for
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the baccalaureate degree in either a technical or scientific field or an academic major of interest to the Navy. In addition, specific Naval Science courses must also be completed.

This study addresses the relationship of technical preparation to performance in post-accession training programs. It also provides a general assessment of the effectiveness of the NROTC program.

Specific initiatives undertaken in support of this study were:

- design and develop a comprehensive management information system by and through which pertinent data could be identified, tracked, and analyzed
- evaluate NROTC graduate performance in post-accession (follow-on) training
- identify academic knowledges required to support entry into post-accession training.

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## SECTION I

## INTRODUCTION

The offices of the Secretary of the Navy (SECNAV), the Chief of Naval Operations (CNO), and the Chief of Naval Education and Training (CNET) have recently focused considerable attention on the Naval Reserve Officers Training Corps (NROTC) program and on the post-accession performance of its graduates. The following issues have been of particular concern:

- effect of "technical" preparation on performance in post-accession professional training programs
- identification of valid criteria by which to assess NROTC unit viability
- establishment of an optimum number and mix of host institutions
- identification and selection of host institutions for future NROTC units
- participation and preparation of minority group members in the NROTC program.

The study reported here addresses the relationship of technical preparation to performance in post-accession training programs; in so doing, it also provides a general assessment of the effectiveness of the NROTC program.

NROTC is one of the two major programs by which regular officers are commissioned for service in the U.S. Navy. The NROTC program, offered through host colleges and universities, requires enrolled midshipmen to complete all institutional requirements for the baccalaureate degree in either a technical or scientific field or an academic major of interest to the Navy. In addition, specific "Naval Science" courses, usually taught by active duty officers assigned to the host institution, must also be completed. The ultimate goal is the thorough preparation of a future Naval officer for his or her initial assignment after commissioning.

During the past several decades, the sophistication and complexity of the U.S. Navy have increased dramatically. Increases in technological complexity in general, application of nuclear power to Naval propulsion systems, and increasing use of advanced technology in Naval weapons and operations have resulted in substantial changes to the amount and kinds of preparation required by incoming officers. Technically-oriented academic programs (i.e., major fields of study in engineering, natural science, mathematics, computer science, operations analysis) are now required of nearly all students who enroll in the U.S. Naval Academy (USNA) or NROTC scholarship programs. The increased requirement for technical training is also reflected in the increased number of newly commissioned officers attending post-accession training programs en route to their first operational assignments; technical emphasis in post-accession training, particularly in warfare specialties (surface, subsurface, aviation), has greatly expanded. A review of current officer retention data and emerging billet requirements, particularly at mid- and senior-grades, appears to support this emphasis on technical preparation. NROTC and USNA programs commission most regular Navy officers; graduates of

other programs (e.g., Officer Candidate School) receive commissions in the Naval Reserve. Historically, the retention percentage of regular Navy officers has been higher than that of reserve officers. Consequently, the requirement that most NROTC and USNA students major in a technical field appears to offer the Navy the greatest potential for maintaining qualified incumbents in technically oriented mid- and senior-grade level billets.

However, other factors affecting officer accessions have emerged to complicate this emphasis on technical preparation. Post-Vietnam attitudes toward military service have not been positive. Both the nation's declining birthrate and the institution of an all-volunteer force (AVF) have reduced the availability of military officer accession program entrants. The technical preparation requirement of officer accession programs may also contribute to a reduction in the number of eligible individuals who apply for these programs.

Moreover, the requirement for current levels of technical preparation has not yet been fully validated. Such a validation is particularly important to demonstrate that such requirements are related to performance in follow-on training and in subsequent billet assignments. Technical programs of study take longer to complete, cost more, and make qualified graduates more competitive for career alternatives outside military service. This last characteristic contributes significantly to the attrition of skilled Navy personnel.

Among NROTC host colleges and universities, the question of technical preparation can be argued from an additional perspective. Elimination of the technical major requirement (also referred to as the "80-20" requirement because 80 percent of entering NROTC midshipmen are required to enroll in technical majors) is expected to expand an institution's student selection base, which, in turn, would permit greater flexibility in selection of higher quality students. A broadened accession base also provides a greater opportunity for minority accessions, a long-term goal of both the military and university communities. Further, more student flexibility in selection of a major field of study would permit consideration of a greater number of potential NROTC host institutions which might not now have sufficient student base or curricula to support the requirement for technical preparation.

**BACKGROUND**

In 1976, the CNO established the policy that requires 80 percent of incoming NROTC scholarship students to enroll in technical majors. Technical majors are defined by CNET to include engineering, mathematics, natural and physical sciences, computer science, and operations analysis (CNETINST 1533.12A). All NROTC scholarship students, regardless of major, are expected to take, at a minimum, calculus, calculus-based physics, and two additional technically-oriented electives. (Nonscholarship students are encouraged to meet this same minimum requirement.) In addition, all NROTC students must complete required Naval Science courses, most of which include some technical material.

Host institution reaction to the 80-20 policy has centered about the validity of the requirement for increased numbers of NROTC graduates with technical majors, the future of NROTC units at nontechnically-oriented host

institutions, and the potential benefits of an expanded selection base which might result were the 80-20 requirement lifted. In February 1979, the Association of NROTC Colleges and Universities, in conjunction with CNET, submitted to the SECNAV a proposed revision to current NROTC scholarship program curriculum requirements. This revised curriculum requires completion of upgraded and expanded technical "core" requirements by all NROTC scholarship students in lieu of the 80 percent technical major requirement and was designed to satisfy both Navy needs and Association concerns. A copy of those revised curricula requirements is found in appendix A.

The Association proposal also suggested that the revised curriculum be evaluated through a pilot program to be offered at representative host institutions. An evaluation plan to support this proposal was developed by the Training Analysis and Evaluation Group (TAEG) and accompanied the Association submission to SECNAV (Heidt, Zajkowski, and Hodak (1979)). The evaluation was designed to assess the impact of the pilot program on NROTC and institutional accession patterns and to determine the adequacy of preparation provided to graduating students by this revised curriculum. Of added benefit was the potential use of the data obtained during the pilot program to address other NROTC program issues.

In June 1980, the SECNAV approved implementation of the proposed pilot program; in April 1981, the evaluation plan was approved. Following a period of time to advertise its availability, the pilot program will be implemented during the school year 1982-83 (class of 1986) and evaluated during the subsequent 6-year period. During this time, all NROTC scholarship students enrolled at participant institutions will be required to complete all "core" curriculum requirements but may select any major field of study.

In order to accurately assess the full impact of the core curriculum when implemented, a requirement exists to develop information describing the relationship between the current NROTC academic program and the performance of NROTC graduates during post-accession training. In addition to forming the bulk of the baseline data against which pilot program data will be compared, this information will provide a general assessment of the effectiveness of the current NROTC program. Moreover, the Management Information System (MIS) developed to process and store information on NROTC student performance during this initial effort would be applicable to subsequent pilot program data storage and analysis requirements. By letter, dated 12 December 1979, the CNET tasked the TAEG to initiate the assessment effort which this document reports.

## PURPOSE

The purpose of this study was to establish and describe the relationship between the NROTC officer accession program and the performance of NROTC graduates in post-accession (follow-on) training. Specific initiatives undertaken in support of this purpose included the following:

- design and develop a comprehensive management information system by and through which pertinent data could be identified, tracked, and analyzed

- evaluate NROTC graduates' performance in post-accession (follow-on) training
- identify academic knowledges required to support entry into post-accession training.

## APPROACH

The approach used to satisfy the requirements of this study was relatively straightforward. Three primary steps were involved:

Step 1. Design and Develop a Management Information System. This step required identification of all pertinent data elements for the system, establishment of tracking and analysis procedures, and review and integration of software/hardware capabilities to ensure a system that would serve the study's purpose. Section II outlines this process and describes the management information system that evolved. A detailed description of the system, user instructions, and examples of system application, are being developed for separate publication. A list of pertinent data elements is found in appendix B.

Step 2. Identify Data Sources and Acquire Data. The various data required for entry into the MIS are maintained in various formats by different commands and activities. A complete list of data source commands and/or activities is included in appendix B. Most data were acquired by formal request made through normal chains of command; in some cases, specific data were developed locally. Tape-to-tape exchanges were made wherever possible; in those cases, when only hard copy information was available, manual translation for ADP entry was accomplished.

Step 3. Analyze Data. Data obtained and entered in the MIS were tabulated and analyzed using standard statistical packages. Frequency counts, computation of means, cross tabulations among data sets, and correlation and regression routines were conducted as appropriate for each major post-accession training program to identify significant relationships among the various preparation and performance data elements. Study conclusions are based on analyses of results obtained.

Throughout the study, a concerted effort was made to identify and use all available sources of information. Historical data in the form of documented studies, reports, and surveys were reviewed, both to suggest possible avenues of exploration and to provide the background against which current data might be assessed. Similarly, communication links were established with other military service activities and/or individuals involved in studies of similar or related topics. A detailed review of applicable literature reporting these efforts may be issued under separate cover; reference material pertinent to this study is contained in the list of references.

## ORGANIZATION OF THIS REPORT

In addition to this introduction, this report contains seven additional sections and three appendices. Section II describes the management information system designed and developed for this study in anticipation of the

pilot program. Information and data demonstrating the relationships between NROTC preparation and post-accession performance are presented, by post-accession training program, in sections III through VII; a synopsis of findings introduces each of these sections. Section VIII summarizes all data and provides a concluding assessment.

Appendix A contains the revised "core" curriculum to be offered at selected NROTC institutions beginning in the fall of 1982. Appendix B lists the data elements included in the supporting MIS and the sources from which these data were obtained. Appendix C contains a listing of NROTC institutional descriptors which were also developed for use in data analysis.

## SECTION II

## THE MANAGEMENT INFORMATION SYSTEM

The accomplishment of the tasks that supported this project required the acquisition, storage, and analysis of a large amount of information. The accumulation of even greater amounts of similar information will be required to accomplish the objective of the pilot program evaluation plan. Most of this information has been, or will be, provided piecemeal, in data sets of varying size. To manage these data, a project-oriented, computer-based management information system (MIS) has been developed. This section provides an overview of the MIS structure and introduces the major variables on which the analyses presented in subsequent sections of this report are based.

### SYSTEM STRUCTURE

The project MIS had to be able to accommodate multiple sources of current and historical data. CNET maintains its own NROTC computer-based tracking and record keeping system which contains information on the entry, throughput, and graduate parts of the NROTC accession pipeline. Recruiting command data sources provided entry information to the MIS; separate data sources for each of the post-accession training programs provided data describing the performance of NROTC program graduates enrolled in "follow-on" training. Information from NROTC-specific, fleet feedback programs was also included. Accommodating different hardware and software configurations among reporting activities was a major effort in consolidating information. This effort was further complicated by the fact that records at some activities differed in format and/or style according to the age of the data: more recent data might be available on magnetic tape but earlier information had been maintained in handwritten records. At several follow-on schools, internal grading policy had also changed over time, requiring the development of equivalency tables for different grading schemes.

The MIS was designed to be compatible with the CNET NROTC Automated Data System (ADS), a computer-based system now on line in support of NROTC program management and evaluation. In the short term, data from the NROTC ADS is expected to become the primary source of information for pilot program tracking and evaluation; future plans call for the assimilation of the project MIS and supporting software by the NROTC ADS.

Figure 1 outlines the major MIS data flow relationships developed for this study. Both current and historical data sources are shown. The following paragraphs identify major contributors to the project MIS and briefly describe the information obtained from each source. Specific data elements from each contributor are listed in appendix B.

**NAVAL RECRUITING COMMAND.** Historical data describing past selections and placement of applicants in the various NROTC units were obtained from the Naval Recruiting Command (NRC). Much of this information is now available through the NROTC ADS. Data elements from these source files describe most of the biographic and demographic information on individual applicants. Such information is useful both to provide background information on NROTC program selectees and to monitor the characteristics of the applicant population from which they were selected.

# NROTC PROJECT MIS SOURCE RELATIONSHIPS

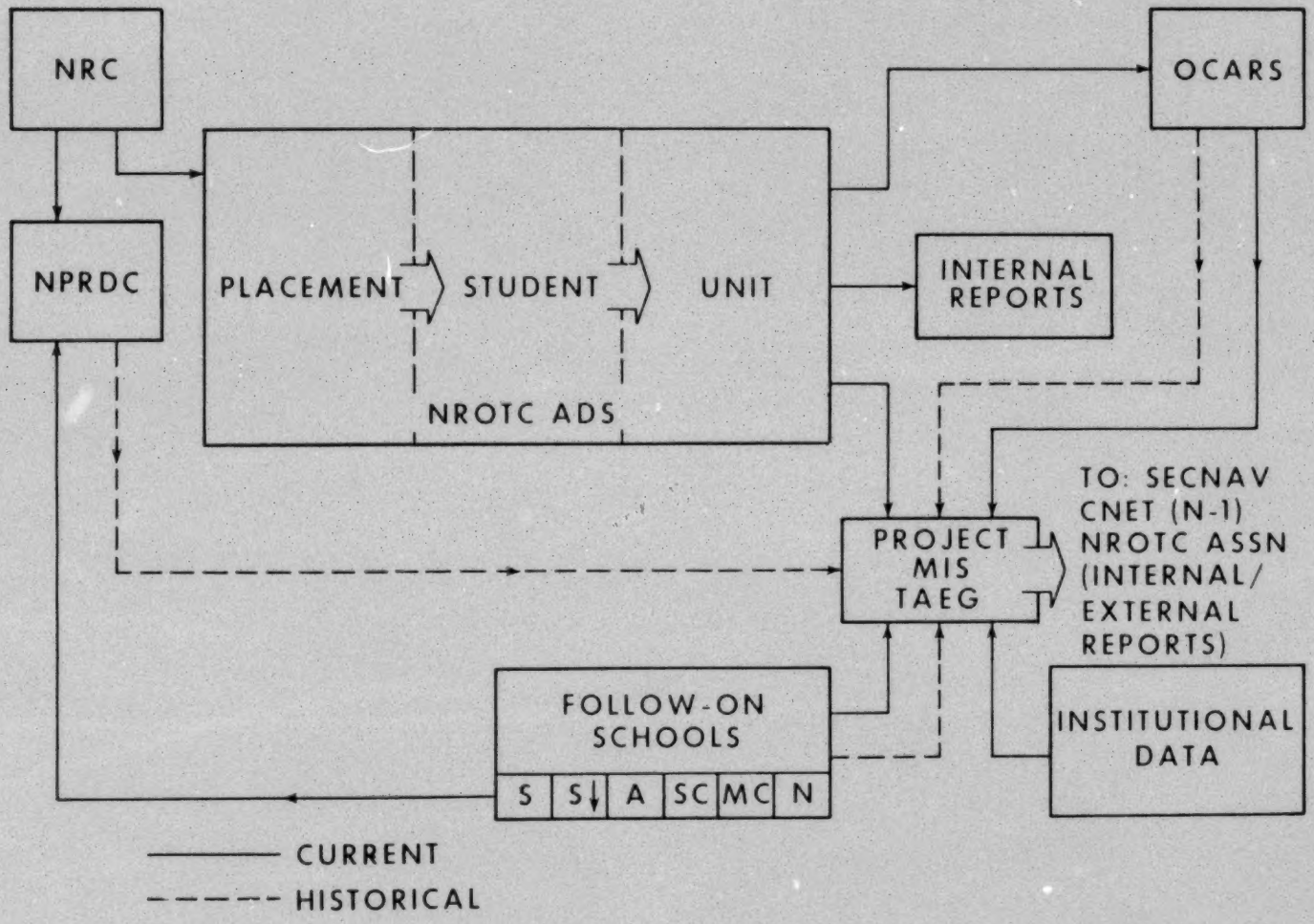


Figure 1. TAEG MIS Source/System Relationships

**NAVY PERSONNEL RESEARCH AND DEVELOPMENT CENTER.** A substantial amount of research in areas related to the NROTC program is ongoing at the Navy Personnel Research and Development Center (NPRDC). Studies completed or underway address the development and refinement of predictors of performance at NROTC entry and/or analyses of performance in follow-on programs by minority group members. Data developed for use in those studies were made available to this project and were used in reference and validation tasks.

**NROTC AUTOMATED DATA SYSTEM (ADS).** This new, computer-based system is now the primary repository for NROTC student, military, and academic data. In addition, it contains a substantial amount of the biographical information, historically originated by NRC, as well as cost and staffing data on each NROTC unit. The ADS, located at CNET headquarters in Pensacola, Florida, is currently expanding its capabilities and will include university and Naval Science course grades, military aptitude scores, college majors, and information needed to monitor unit accession patterns. Because of its recent implementation, little historical (baseline) information was available to the current study from the NROTC ADS; however, the ADS is designed to provide most of the future information requirements about students in the NROTC program. These data will be used in conjunction with performance data obtained from follow-on programs. Additional technical and format information on the NROTC ADS is contained in the NROTC ADS User's Manual.

**NAVAL MILITARY PERSONNEL COMMAND (NMPC) OFFICER CANDIDATE ACCOUNTING AND RECORDKEEPING SYSTEM (OCARS).** NMPC maintains official records on all officer candidates enrolled in Navy accession pipelines. Input to this system is provided by individual program offices. Prior to the implementation of the NROTC ADS, NROTC input was provided as hard copy for keypunch and entry into OCARS. The implementation of the NROTC ADS will automate the information transfer process and should increase the OCARS reliability and currency.

Because it was begun in 1975, the OCARS contains some historical data pertinent to this project. Where appropriate and available, these data were transferred from OCARS to the TAEG MIS. The availability of the NROTC ADS should obviate the requirement for an OCARS input to the TAEG MIS, although future OCARS data might be useful for validation purposes.

**FOLLOW-ON SCHOOL ACTIVITIES.** Data were obtained for five major officer post-accession training program areas: surface, subsurface, aviation, nuclear power, and supply. Excluding Marine Option students, these five program areas encompass about 95 percent of all the initial follow-on training for NROTC graduates conducted by the Navy (see figure 2). Data from remaining Navy and/or Marine Corps programs could be added at a later time if desired.

Data obtained from follow-on activities describes the performance of the NROTC graduate and usually adds to his/her biographical data as well. Criterion variables (performance data) normally included some combination of final grade point average, class standing and/or module test scores. Because data formats differ among source activities, the development of equivalency tables was necessary before students from different follow-on programs could be compared.

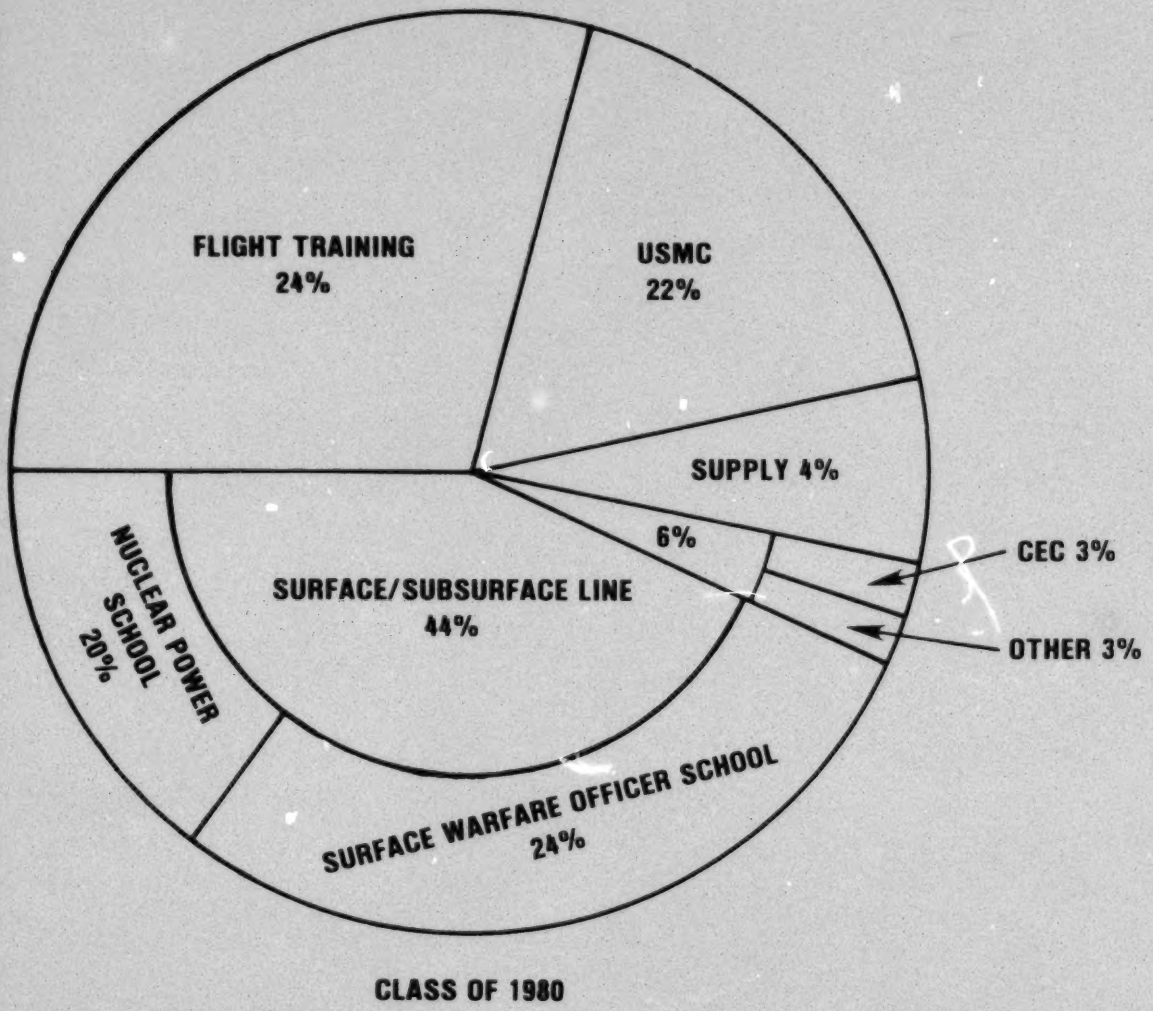


Figure 2. NROTC Graduate Assignments to Warfare/Staff Corps Specialty

Additional specific information on the data acquisition process used for each follow-on program is included in later sections of this report where it applies.

**INSTITUTIONAL DATA.** Information describing the characteristics of participating host NROTC institutions was derived from review of institution catalogs and commercially published documentation. Information about each institution included size, public or private control, institutional type (e.g., multiversity; letters, arts, sciences (LAS); technical), geographic location, and various characteristics of student populations. Additional institutional descriptors may be added as necessary. More detailed information on pilot program institutions will be obtained directly from the institutions as necessary.

## SYSTEM APPLICATION

Although the project data base to support the NROTC pilot program resides at TAEG, the hardware and services of the Florida University Computer System are used to perform data analysis and print reports. Entry to high capacity units located on the Gainesville and/or Orlando campuses is gained through TAEG's WANG 2200 series mini computer system. Study data are entered locally, programs are transmitted to one of the larger systems for processing, and results are printed at the University of Central Florida in Orlando.

Locally developed software packages are used to merge the various files of source data. The commercially available Statistical Package for the Social Sciences (Nie, Hull, Jenkins, Steinbrenner, and Best, 1975) is used for data analysis. Coordination among the various data sources is maintained on a relatively frequent basis to provide data updates.

## SYSTEM CAPABILITY

The TAEG MIS that has emerged in support of this project promises to be a powerful management and analytic tool. Current use of the MIS, in support of current NROTC projects or anticipated in support of the pilot program core curriculum evaluation, includes the development of statistical information on individual units and institutions grouped according to selected characteristics. Management evaluations of these data will assist program managers to make curricular and program decisions. Other potential uses of the TAEG MIS include:

- providing support for the evaluation of NROTC units, and the performance of NROTC graduates, in situations/assignments other than immediate post-accession training
- serving as a data base to be used in assessing NROTC unit viability
- supporting the feedback of information to post-accession training activities to aid in review/revision of their follow-on training programs.

**DATA ELEMENTS**

Although there are unique data elements available which describe special characteristics of a particular data set, variables common to all programs were identified and used to provide a basis for intra- and inter-program evaluations. The standard elements, or system variables, included:

- SSN: the social security number of each NROTC graduate was used to identify and/or group all computer analyses.

- Class: identifies the post-accession program class, by number or year of enrollment in which the NROTC graduate was first enrolled. Normally, this data element included the year of enrollment and the sequential number of the class begun during that year (e.g., SWOS class no. 7905 would be the 5th class to begin Surface Warfare Basic School during Fiscal Year (FY) 1979).

- College: the institution/NROTC unit location from which the NROTC student graduated and/or was commissioned. Fifty-five colleges or universities are identified.

- Major: the NROTC graduate's primary field of academic study while enrolled at the baccalaureate level at the college. For the current study, only the final major, or major of record, has been identified; in developing additional data for the pilot program evaluation, changes to major fields of study will be monitored. A total of 98 majors were coded and referred to by name. Where these data are unavailable, the majors are listed as "missing." If an identified major does not have a corresponding numerical code, it is identified for discussion purposes as "other."

- Technical/nontechnical major: groups major fields of study so as to distinguish between those in a "technical area" (e.g., science, engineering, math) and those that are not technically oriented (e.g., social sciences, education, business). CNETINST 1533.12A provides guidance on the assignment of a major field of study to one of these categories.

- Grade point average (GPA): an average of all grades obtained during a specified portion of the post-accession training period. Although this number usually indicates a final assessment of performance, in some cases it may reflect performance over some portion of curriculum. A GPA may be computed on the basis of either a 4.0 or 100 point scale.

- Standing: the relative position of an NROTC student to all others regardless of accession source in his/her class upon graduation from post-accession training. A standing may be based solely on GPA or on a combination of factors usually including GPA. For purposes of the current study, standing is shown in deciles (e.g., top 10%, second 10%).

- Attrition: an indicator that the NROTC graduate did not complete his post-accession study program. As currently coded, this variable does not distinguish among reasons for attrition.

- Setback: an indicator that the NROTC graduate was removed from his original class and re-enrolled in a class convened at some later date. This action permits a student to retake certain material which may have caused difficulty and/or accommodates students whose programs of study are interrupted for various non-academic reasons as well (e.g., sickness, home difficulty). As currently coded, this variable does not distinguish among reasons for setback.

In addition to these common data elements, a set of institutional descriptors was also developed for use in data analysis. These characteristics were applicable to all post-accession programs analyzed and include the following variables/elements:

- Rank: a level of competitiveness among institutions based on college entry requirements and percent of applicants accepted for entry. This variable has been extracted from Barron's Profiles of American Colleges (1977) and includes the following comparative levels:

| RANK | SAT/ACT AVG | % ACCEPTED | REMARKS |
|---|---|---|---|
| 1 | 675-800/28+ | top 10-20% | Most competitive |
| 2 | 600-675/26+ | top 20-30% | Highly competitive |
| 3 | 550-600/23+ | top 30-50% | Very competitive |
| 4 | 450-550/21+ | top 50% | Competitive |
| 5 | less than 450/21 | top 75% | Less competitive |
| 6 | NA | NA | No entry requirements |

- Type: describes the primary academic thrust of the institution as (1) multipurpose university, (2) technical institution, (3) letters, arts, sciences (LAS).

- Environment: describes the environmental location of the institution as (1) suburban, (2) urban, (3) rural.

- Geographic location: identifies the general geographic location of the institution as (1) Northeast, (2) West, (3) Midwest, (4) Southeast.

- Control: describes the institution in terms of fiscal and/or regulatory control, as (1) public, (2) private, (3) Roman Catholic.

- Coeducational status: identifies those institutions whose undergraduate enrollments are primarily male.

- Size: describes the numbers of students at the institution as (1) less than 5,000, (2) 5-10,000, (3) 10-15,000, (4) 15-20,000, (5) greater than 20,000.

- Salary: compares institutions in terms of their average salaries paid to faculty members as (1) high, (2) average, (3) lower than average.

- Ethnic: identifies those institutions whose undergraduate enrollments are primarily composed of minority race/ethnic group members.

Appendix C contains a listing of NROTC institutions categorized by these descriptors.

## SECTION III

## NROTC GRADUATE PERFORMANCE AT SURFACE WARFARE OFFICER SCHOOL

### SYNOPSIS

The performance of NROTC graduates at SWOS Basic is described by criterion-based test (CT) scores achieved in 21 subject areas and by attrition and setback data. Using manually obtained project data describing 1,139 cases, NROTC graduates entering SWOS Basic classes during FY 1977 - FY 1980 achieved a mean CT score (GPA) of 3.50 (S.D. = .49; 4.0 scale) and attrition and setback rates of 2.9 percent and 7.9 percent, respectively. Validation data obtained independently from SWOS for 1,758 NROTC graduate accessions for the same period showed a comparable CT GPA of 3.44, but significantly higher attrition (6.0 percent) and somewhat lower setback (5.8 percent) rates. CT scores grouped by NROTC unit attended (college or university), academic major, and class year produced GPAs ranging from 3.08 to 3.77; however, the small number of cases for some schools and majors suggest that these data may not be truly representative. By class year, NROTC accession performance has been relatively consistent.

The level of preparedness for NROTC accessions may be more directly indicated by scores on pretests (PT) administered on entry and covering the same 21 subject areas. Data on 1,758 NROTC accessions provided by SWOS show an average NROTC PT score of 1.98. This score is .08 below the mean for nearly 5,000 SWOS students representing all accession sources. Project data describing pretest performance show an average PT score of 1.58 (S.D. = .92, N = 1,071), somewhat lower than that found by SWOS review. This discrepancy, as well as differences between project and other data on attrition and setback, suggest areas for future MIS refinement. No project data for other accession source pretest scores were obtained and comparison among such data was not possible.

Comparisons of PT and CT scores and setback rates between NROTC graduates grouped by technical or nontechnical majors show that students with technical backgrounds average higher scores on all PT and CT subject areas. The significant differences between group averages in engineering and other technical areas was expected; however, NROTC accessions with technical backgrounds also attained significantly better CT scores in several Navy specific subject areas (e.g., Watchstanding, Rules of the Road, Maneuvering Board, Navigation). Attrition data were insufficient for comparisons between these two groups, but the setback rate for technical majors was about half that of nontechnical majors.

Comparisons among NROTC accessions grouped by characteristics of their institution show that graduates of schools with higher entry requirements perform better than graduates of schools with less rigid entry standards by all measurement criteria. Consistent with this finding, students from institutions with lower faculty salaries and/or predominately minority student populations also do less well than their counterparts. Attrition and setback data support these findings: among minority institution graduates, attrition and setback rates were five times that of graduates of nonminority schools.

Graduates of institutions emphasizing technical preparation and accessions from predominately male institutions also demonstrated higher levels of performance. Largest numbers of technical accessions came from competitive, smaller, predominately male institutions and the Northeast.

## BACKGROUND

NROTC graduates commissioned as surface line officers and assigned to surface ship billets receive initial post-accession training at the Surface Warfare Officer School Basic (SWOS Basic) course offered at either Newport, Rhode Island, or San Diego, California. SWOS Basic is the first in a sequence of courses that prepare such officers for specific duty assignments as they progress through the various stages of this warfare specialty. The SWOS Basic course provides students with a foundation in surface warfare fundamentals which is essential for qualification as a Surface Warfare Officer (SWO). The course, roughly 16 weeks in length, is taught by Navy personnel, most of whom are already qualified in the surface warfare specialty.

The SWOS Basic curriculum is comprised of the instructional units shown in table 1. The basis for evaluation of an officer's performance and the achievement of each unit's learning objectives is a criterion-referenced examination system applied through the administration of a series of different types of tests. Knowledge tests, performance tests, and subjective evaluations all contribute to the evaluation process. For units 1-21, diagnostic pretests (PT) are administered on entry to identify those subject areas in which a student may require additional study; criterion-based unit tests (CT) are administered at the end of each unit to ensure completion of learning objectives; comprehensive tests (CX) are administered after completion of a predetermined number of units to assess a student's cumulative performance during training. A mean performance standard of 3.2 on a 4.0 scale (80 percent) has been established for all CTs to ensure a final performance achievement average of 75 percent of the established objectives. For units 1 (Maneuvering Board required standard 3.0), 5 (Rules of the Road, required standard 3.2), and 6 (Navigation, performance test, required standard 3.0), specific test score requirements must be met or the test must be repeated until prescribed standards are reached. An attainment standard of 3.0 for each CX is also a course requirement. For units 22-25, which emphasize the practical application or practice of shiphandling/tactical operations, a subjective assessment of "hands on" performance is made.

Performance data for units 1-21 were acquired for use in the current analysis. Data on the practice units (22-25) were not considered appropriate for use in the current study and were not obtained. To provide an overall mean entry level score (AVGPT), individual PT unit scores were equally weighted and averaged; to provide a combined, end-of-course assessment criterion (GPA), individual CT unit test scores were averaged, again assuming equal value for each unit's score. These means, together with individual unit CT and PT scores, attrition data, and setback data were used as performance criteria in analyzing NROTC graduate performance at SWOS. All of the major variables described in section II were used as independent/moderator variables with the exception of "class standing," for which no data were available.

TABLE 1. SWOS BASIC COURSE UNIT DESCRIPTION

| UNIT NO. | TITLE | UNIT NO. | TITLE |
|---|---|---|---|
| 1 | Maneuvering Board & Tactics | 15 | Inspections & Safety |
| 2 | Watchstanding & Seamanship | 16 | Material Management |
| 3 | CIC Watch Officer | 17 | Steam Propulsion & Auxiliary System |
| 4 | External Communications | 18 | Diesel & Gas Turbine Propulsion |
| 5 | Rules of the Road | 19 | Engineering Administration and Records |
| 6 | Navigation | 20 | Damage Control (Phase I) |
| 7 | Naval Ordnance | 21 | Damage Control (Phase II) |
| 8 | Antisubmarine Warfare | *22 | Professional Development |
| 9 | Surface Combat Operations | *23 | Ship Simulator/Underway Training Craft |
| 10 | Mine and Amphibious Warfare | *24 | Underway Training |
| 11 | Inport Watch Officer | *25 | Tactical Training/Underway Training Craft |
| 12 | Personnel Organization & Administration | | |
| 13 | Human Resources Management | | |
| 14 | Shipboard Training and Administration | | |

*Practical application units, not part of CT/CX testing format; no data acquired.

Data describing 18 variables for 1,139 NROTC graduates were developed from course records and college background information. Data were acquired for the period beginning with class 7602 (the second class of FY 1976) through class 8004. Both East and West Coast schools are represented in the data base. Most of the data were retrieved from handwritten records and manually entered into the TAEG MIS; in those few instances where data were available in computer compatible formats, direct tape-to-tape transfer of information was accomplished.

Some cautions with respect to the data base are appropriate. First, not all data sets describing individual cases were complete; thus, analyses are based on the number of cases (N) for which specific data were actually obtained. When more than one variable is included in an analysis, the variable with the smallest N determined the total number of cases used for analysis. Where appropriate, the effect of variations in N is discussed in the text. A profile of SWOS Basic course data obtained and used to describe course characteristics and student performance is provided in table 2. The number of missing observations for each variable is included in that profile.

It should also be noted that some course or curriculum revisions were made during the period for which data were obtained. Accordingly, equivalency tables were developed and applied to data from earlier classes to produce a standard data set reflective of current conditions (FY 1980-1981). Where necessary, reorganization of unit sequence was accommodated in the same manner. The software programs by which these translations were accomplished have been retained for future use.

## PRESENTATION OF DATA

The total amount of raw data acquired by TAEG to support both this analysis and the development of baseline information for future comparison is extensive. Similarly, the number of variables included in the data set permit a wide variety of combinations for review and comparison. Because of space constraints, some selectivity in data presentation has been exercised. Data describing NROTC graduate performance in general terms or responding to certain specific issues are presented in the text of this report. When necessary for clarity or completeness, more specific data and/or supporting analyses are provided as appendices; still other information, of interest but not directly pertinent to the current effort, has been retained by the TAEG and is available through the NROTC program manager.

**NROTC GRADUATE PERFORMANCE AT SWOS BASIC.** Based on data acquired for this project, the performance of NROTC graduates at SWOS Basic is most simply described by the mean GPA for all cases containing a complete set of CT scores: 3.496 (4.0 scale, S.D. = .49, N = 959). Tables 3 through 5 break this performance variable into component parts. Individual NROTC unit performance is described by mean GPA, standard deviation, variance, and N in table 3; unit GPAs ranged from 3.09 (S.D. = .99, N = 12) to 3.77 (S.D. = .15, N = 9). Tables 4 and 5 provide similar statistics for performance grouped by major fields of study and class years, respectively. Figure 3 depicts the trend in GPA performance as a function of class. Although somewhat variable at the outset, NROTC graduate performance at SWOS Basic has

TABLE 2. SWOS BASIC COURSE PROFILE DATA

| VARIABLE NAME | CATEGORIES | NUMBER OF USABLE CASES (%)* | MISSING CASES (%)* |
|---|---|---|---|
| Class | | 1,138 (100) | 1 |
| College (units) | | 1,106 (97.1) | 33 ( 2.9) |
| Major | | 969 (85.1) | 170 (14.9) |
| | Technical | 509 (44.7) | |
| | Nontechnical | 460 (40.4) | |
| Attrite | | 1,138 (100) | 1 |
| | Nonattrite | 1,106 (97.2) | |
| | Attrite | 32 ( 2.8) | |
| Setback | | 1,138 (100) | 1 |
| | Nonsetback | 1,051 (92.4) | |
| | Setback | 87 ( 7.6) | |
| Institutional Characteristics: | | 1,106 (97.1) | 33 ( 2.9) |
| Barron's Ranking | Most Competitive | 7 ( 0.6) | |
| | Highly Competitive | 116 (10.2) | |
| | Very Competitive | 241 (21.2) | |
| | Competitive | 611 (53.6) | |
| | Less Competitive | 90 ( 7.9) | |
| | Noncompetitive | 41 ( 3.6) | |
| Environment | Suburban | 537 (47.1) | |
| | Urban | 475 (41.7) | |
| | Rural | 94 ( 8.3) | |
| Control | Public | 861 (75.6) | |
| | Private | 148 (13.0) | |
| | Catholic | 97 ( 8.5) | |
| Location | NE | 244 (21.4) | |
| | W | 228 (20.0) | |
| | MW | 228 (20.0) | |
| | SE | 406 (35.6) | |
| Coed Status | Coed | 1,029 (90.3) | |
| | Male only | 77 ( 6.8) | |
| Student Population | Predominately Majority | 1,033 (90.7) | |
| | Predominately Minority | 73 ( 6.4) | |

*May not total 100 percent due to rounding.

TABLE 2. SWOS BASIC COURSE PROFILE DATA (continued)

| VARIABLE NAME | CATEGORIES | NUMBER OF USABLE CASES (%)* | MISSING CASES (%)* |
|---|---|---|---|
| Type | University | 859 (75.4) | |
| | Technical | 142 (12.4) | |
| | LAS | 105 ( 9.2) | |
| Salary | High Faculty Salary | 454 (39.9) | |
| | Avg Faculty Salary | 227 (19.9) | |
| | Low Faculty Salary | 425 (37.3) | |
| | Pay (AAUP)** Top 20% | 224 (23.1) | |
| | 20-40% | 357 (36.8) | |
| | 40-60% | 175 (18.1) | |
| | 60-80% | 213 (22.0) | |
| Size | Less than 5,000 | 268 (24.2) | |
| | 5,000 - 10,000 | 346 (31.3) | |
| | 10,000 - 15,000 | 156 (14.1) | |
| | 15,000 - 20,000 | 157 (14.2) | |
| | Over 20,000 | 179 (16.2) | |

*May not total 100 percent due to rounding.
**AAUP = American Association of University Professors.

TABLE 3. MEAN SWOS GPA BASED ON COMBINED CT SCORES BY NROTC UNIT

| COLLEGE/ INSTITUTION | MEAN | STD DEV | VARIANCE | N |
|---|---|---|---|---|
| AUBURN | 3.49 | 0.74 | 0.55 | 26 |
| U C BERKELEY | 3.71 | 0.08 | 0.01 | 3 |
| UCLA | 3.11 | 1.04 | 1.08 | 11 |
| CITADEL | 3.51 | 0.26 | 0.07 | 53 |
| U COLORADO | 3.66 | 0.25 | 0.06 | 9 |
| CORNELL | 3.74 | 0.23 | 0.05 | 16 |
| DUKE | 3.58 | 0.22 | 0.05 | 14 |
| U FLORIDA | 3.49 | 0.25 | 0.06 | 26 |
| FLORIDA A&M | 3.40 | 0.21 | 0.04 | 17 |
| GEORGIA TECH | 3.60 | 0.18 | 0.03 | 26 |
| HOLY CROSS | 3.50 | 0.36 | 0.13 | 17 |
| U IDAHO | 3.48 | 0.22 | 0.05 | 13 |
| IIT | 3.78 | 0.15 | 0.02 | 9 |
| U ILLINOIS | 3.18 | 1.06 | 1.13 | 11 |
| IOWA ST | 3.50 | 0.19 | 0.04 | 13 |
| JACKSONVILLE U | 3.55 | 0.23 | 0.05 | 14 |
| U KANSAS | 3.38 | 0.96 | 0.92 | 15 |
| MAINE MARITIME | 3.59 | 0.19 | 0.03 | 18 |
| MARQUETTE | 3.31 | 0.81 | 0.65 | 20 |
| MIT | 3.60 | 0.24 | 0.06 | 7 |
| MIAMI U OHIO | 3.43 | 0.84 | 0.70 | 21 |
| U MICHIGAN | 3.62 | 0.28 | 0.08 | 18 |
| U MINNESOTA | 3.56 | 0.16 | 0.02 | 11 |
| U MISSISSIPPI | 3.31 | 0.91 | 0.82 | 16 |
| U MISSOURI | 3.53 | 0.25 | 0.06 | 19 |
| U NEBRASKA | 3.51 | 0.16 | 0.03 | 7 |
| U NEW MEXICO | 3.54 | 0.21 | 0.04 | 17 |
| U N CAROLINA | 3.47 | 0.20 | 0.04 | 10 |
| NORTHWESTERN | 3.61 | 0.14 | 0.02 | 8 |
| NOTRE DAME | 3.60 | 0.17 | 0.03 | 20 |
| OHIO ST | 3.47 | 0.20 | 0.04 | 17 |
| U OKLAHOMA | 3.14 | 1.20 | 1.45 | 9 |
| OREGON ST | 3.59 | 0.15 | 0.02 | 16 |
| PENN ST | 3.58 | 0.21 | 0.04 | 46 |
| U PENNSYLVANIA | 3.56 | 0.27 | 0.07 | 17 |
| PRAIRIE VIEW | 3.09 | 0.99 | 0.97 | 12 |
| PURDUE | 3.44 | 0.80 | 0.64 | 22 |
| RPI | 3.55 | 0.17 | 0.03 | 30 |
| RICE | 3.61 | 0.22 | 0.05 | 4 |
| U ROCHESTER | 3.29 | 1.04 | 1.09 | 24 |
| SAVANNAH ST | 3.50 | 0.22 | 0.05 | 6 |
| U S CAROLINA | 3.44 | 0.19 | 0.04 | 18 |
| USC | 3.51 | 0.15 | 0.02 | 14 |
| SOUTHERN A&M | 3.29 | 0.23 | 0.05 | 14 |
| TEXAS A&M | 3.50 | 0.20 | 0.04 | 33 |
| TEXAS | 3.47 | 0.76 | 0.58 | 24 |
| TULANE | 3.63 | 0.19 | 0.04 | 13 |
| U UTAH | 3.24 | 1.09 | 1.19 | 11 |
| VANDERBILT | 3.57 | 0.29 | 0.09 | 22 |
| VILLANOVA | 3.57 | 0.18 | 0.03 | 31 |
| U VIRGINIA | 3.63 | 0.25 | 0.06 | 21 |
| U WASHINGTON | 3.62 | 0.13 | 0.02 | 15 |
| U WISCONSIN | 3.52 | 0.18 | 0.03 | 8 |
| SUNY MARITIME | 3.61 | 0.23 | 0.05 | 24 |
| VMI | 3.40 | 0.16 | 0.03 | 23 |
| Average | 3.496 | 0.49 | 0.24 | 959 |

TABLE 4. COMBINED SWOS MEAN GPA BY MAJOR FIELD OF STUDY

| MAJOR | MEAN | STD DEV | VARIANCE | N |
|---|---|---|---|---|
| AGRICULT | 3.49 | 0.23 | 0.05 | 5 |
| FORESTRY | 3.44 | 0.38 | 0.14 | 3 |
| MISC AGR | 3.47 | 0.0 | 0.0 | 1 |
| SCIENCES | 3.52 | 0.21 | 0.05 | 23 |
| BIOL SCI | 3.58 | 0.19 | 0.04 | 12 |
| BOTANY | 3.59 | 0.26 | 0.07 | 4 |
| BACTERIO | 3.22 | 0.0 | 0.0 | 1 |
| ZOOLOGY | 3.60 | 0.16 | 0.03 | 7 |
| ETOMOLO | 3.54 | 0.23 | 0.05 | 2 |
| MISC BIO | 3.44 | 0.71 | 0.50 | 29 |
| OPTOMETR | 3.70 | 0.0 | 0.0 | 1 |
| MISC MED | 3.60 | 0.0 | 0.0 | 1 |
| GEOLOGY | 3.67 | 0.15 | 0.02 | 10 |
| NAUT SCI | 3.51 | 0.11 | 0.01 | 3 |
| OPS RSCH | 3.38 | 0.0 | 0.0 | 1 |
| METEORL | 3.18 | 1.30 | 1.69 | 8 |
| CHEMISTRY | 3.55 | 0.27 | 0.07 | 25 |
| BIOCHEM | 3.80 | 0.0 | 0.0 | 1 |
| OCEANOG | 3.61 | 0.25 | 0.06 | 8 |
| METALLUR | 3.47 | 0.10 | 0.01 | 2 |
| MATH | 3.54 | 0.19 | 0.04 | 34 |
| PHYSICS | 3.58 | 0.22 | 0.05 | 16 |
| PHYS SCI | 3.62 | 0.21 | 0.04 | 4 |
| CIV ENG | 3.63 | 0.21 | 0.04 | 29 |
| AGRI ENG | 3.55 | 0.0 | 0.0 | 1 |
| COMP SCI | 3.37 | 0.83 | 0.69 | 20 |
| NAV ARCH | 3.60 | 0.16 | 0.03 | 27 |
| NUC ENG | 3.62 | 0.24 | 0.06 | 24 |
| INDS ENG | 3.63 | 0.20 | 0.04 | 16 |
| CHEM ENG | 3.54 | 0.23 | 0.05 | 29 |
| ELEC ENG | 3.55 | 0.23 | 0.05 | 58 |
| MECH ENG | 3.58 | 0.21 | 0.04 | 54 |
| AERO ENG | 3.66 | 0.13 | 0.02 | 8 |
| ARCHITCT | 3.93 | 0.0 | 0.0 | 1 |
| ENGINEER | 3.44 | 0.84 | 0.71 | 19 |
| FRGN AFF | 3.59 | 0.21 | 0.04 | 18 |
| POLY SCI | 3.42 | 0.63 | 0.40 | 68 |
| INDS ART | 3.13 | 1.11 | 1.24 | 10 |
| HISTORY | 3.56 | 0.23 | 0.05 | 51 |
| INDS MGT | 3.85 | 0.0 | 0.0 | 1 |
| PERS ADM | 3.44 | 0.26 | 0.07 | 2 |
| PSYCHOL | 3.48 | 0.20 | 0.04 | 13 |
| ANTHROPL | 3.56 | 0.12 | 0.01 | 2 |
| ARCHEOL | 3.56 | 0.0 | 0.0 | 1 |
| ECONOMICS | 3.43 | 0.70 | 0.49 | 28 |
| ACCOUNTG | 3.49 | 0.31 | 0.09 | 8 |
| GEOGRAPH | 3.51 | 0.24 | 0.06 | 11 |
| BUS ADM | 3.48 | 0.48 | 0.23 | 76 |
| FINANCE | 3.59 | 0.23 | 0.05 | 8 |
| PHYS ED | 3.43 | 0.15 | 0.02 | 4 |
| EDUCATION | 3.13 | 1.08 | 1.16 | 11 |
| JOURNL | 3.53 | 0.26 | 0.07 | 11 |
| SOC SCI | 3.56 | 0.34 | 0.12 | 12 |
| FINE ARTS | 3.20 | 1.03 | 1.07 | 12 |
| ENGLISH | 3.49 | 0.24 | 0.06 | 20 |
| LANGUAGE | 3.55 | 0.31 | 0.10 | 8 |
| PHILOSOPHY | 3.39 | 0.13 | 0.02 | 3 |
| NOT ELSEWHERE CLASSIFIED | 3.00 | 1.34 | 1.81 | 13 |
| Average | 3.50 | 0.50 | 0.25 | 883 |

TABLE 5. COMBINED MEAN GPA BY CLASS

| CLASS | MEAN | STD DEV | VARIANCE | N |
|---|---|---|---|---|
| 8004 | 3.47 | 0.16 | 0.03 | 51 |
| 8003 | 3.46 | 0.18 | 0.03 | 37 |
| 8002 | 3.45 | 0.21 | 0.04 | 34 |
| 8001 | 3.50 | 0.21 | 0.04 | 91 |
| 7906 | 3.55 | 0.15 | 0.02 | 94 |
| 7905 | 3.58 | 0.68 | 0.47 | 73 |
| 7904 | 3.52 | 0.19 | 0.03 | 63 |
| 7903 | 3.46 | 0.24 | 0.06 | 18 |
| 7902 | 3.38 | 0.63 | 0.39 | 35 |
| 7901 | 3.42 | 0.62 | 0.39 | 36 |
| 7805 | 3.44 | 0.27 | 0.07 | 29 |
| 7804 | 3.56 | 0.22 | 0.05 | 45 |
| 7803 | 3.77 | 0.18 | 0.03 | 29 |
| 7802 | 3.64 | 0.25 | 0.06 | 38 |
| 7801 | 3.78 | 0.19 | 0.04 | 42 |
| 7706 | 3.48 | 0.57 | 0.33 | 44 |
| 7705 | 3.53 | 0.27 | 0.07 | 22 |
| 7704 | 3.65 | 0.31 | 0.10 | 38 |
| 7703 | 3.08 | 1.19 | 1.42 | 32 |
| 7702 | 3.18 | 1.06 | 1.12 | 43 |
| 7701 | 3.47 | 0.58 | 0.34 | 48 |
| 7602 | 3.75 | 0.20 | 0.04 | 46 |
| Average | 3.50 | 0.52 | 0.27 | 987 |

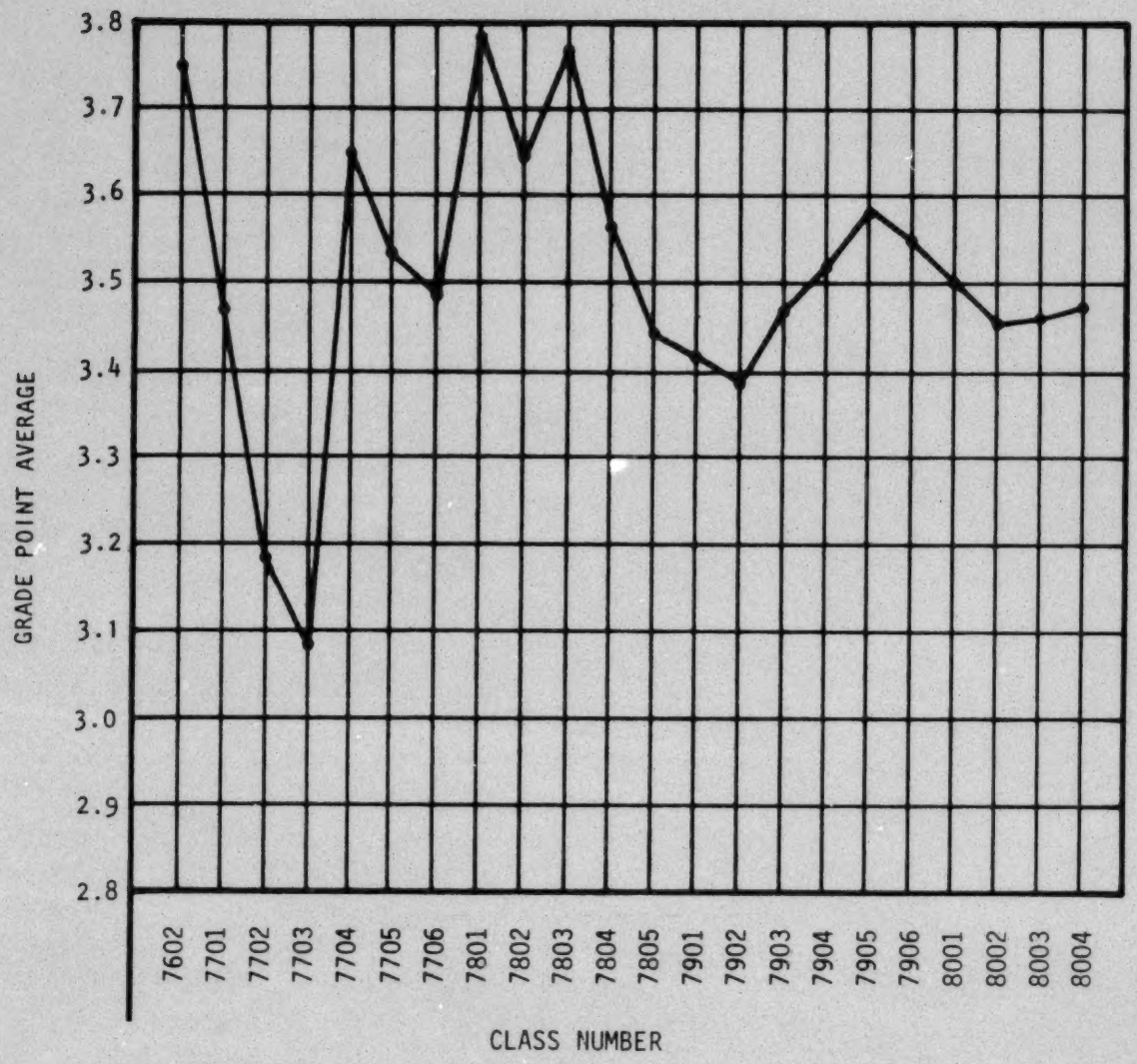


Figure 3. NROTC SWOS Basic Performance Trend as Measured by Class GPA

leveled off to an approximation of the mean unit (CT) GPA. When graphed by fiscal year group (figure 4), the lack of variation in GPA among classes is clear and, with the exception of the higher GPA in FY 1978, performance has been relatively consistent.

A second perspective on NROTC graduate performance at SWOS Basic can be gained by review of attrition and/or setback data. Project data (N = 1,106 cases) show a combined attrition of 2.9 percent and an overall setback rate of 7.9. Tables 6, 7, and 8 provide more specific attrition and setback data, grouped by institution, SWOS Basic class number, and major field of study, respectively.

GPA and attrition/setback performance indicators derived from project data were compared with historical data developed independently by SWOS Basic staff. These comparisons permitted the identification of potential problem areas in data acquisition and provided an initial indication of the accuracy of project data. Data prepared by SWOS Basic School for classes 76T01-8003 (FY 1977 - FY 1980) described 1,758 cases and showed that NROTC graduates had attained a cumulative GPA of 3.438. Using these same data, attrition and setback rates were 7.39 and 5.8 percent, respectively. The similarity of cumulative GPAs derived independently, indicates that the TAEG MIS use of CT scores for computing GPA, and the accuracy of those derived scores, are satisfactory. However, the substantial difference in Ns between the two data sets suggests that some SWOS Basic data were missed by TAEG during its manual retrieval process. The relatively lower attrition percentages derived from project data indicate that a substantial proportion of those missing cases may have reflected attrites or setbacks. This deficiency may have been partly due to class records for attrites or setbacks which were kept separately, or discarded at an earlier time, or omitted from project data files because they lacked useful information. For example, project data (table 7) show no attrites until FY 1979. Comparisons of attrition and setback percentages using only FY 1979 and FY 1980 data do narrow the difference somewhat; however, remaining discrepancies are sufficient to warrant a more careful approach to attrition and setback in future data acquisition efforts. Project identification of future attrites and setbacks should be made easier by use of computerized performance records now available for current SWOS Basic classes.

**NROTC GRADUATE PREPAREDNESS FOR SWOS BASIC.** All students entering SWOS Basic are administered a diagnostic pretest, the content of which reflects major source program (NROTC, USNA, OCS) curriculum objectives. The pretest assesses the level of students' knowledge and their readiness for course material and identifies specific subject areas where individual students need remedial work and/or counseling. Like the CT examinations, these pretests are administered and scored to show performance in each of the 21 curricular areas shown in table 1 (page 22).

Table 9 provides the average of pretest scores (AVGPT) achieved by NROTC graduates for whom data were available by NROTC unit. AVGPT scores ranged from 1.02 (4.0 scale, S.D. = .80, N = 16) to 2.7 (4.0 scale, S.D. = .27, N = 3); the overall AVGPT was 1.57 (S.D. = .92, N = 1,071). Performance scores for each of the 21 curricular areas, cumulatively and by unit, have

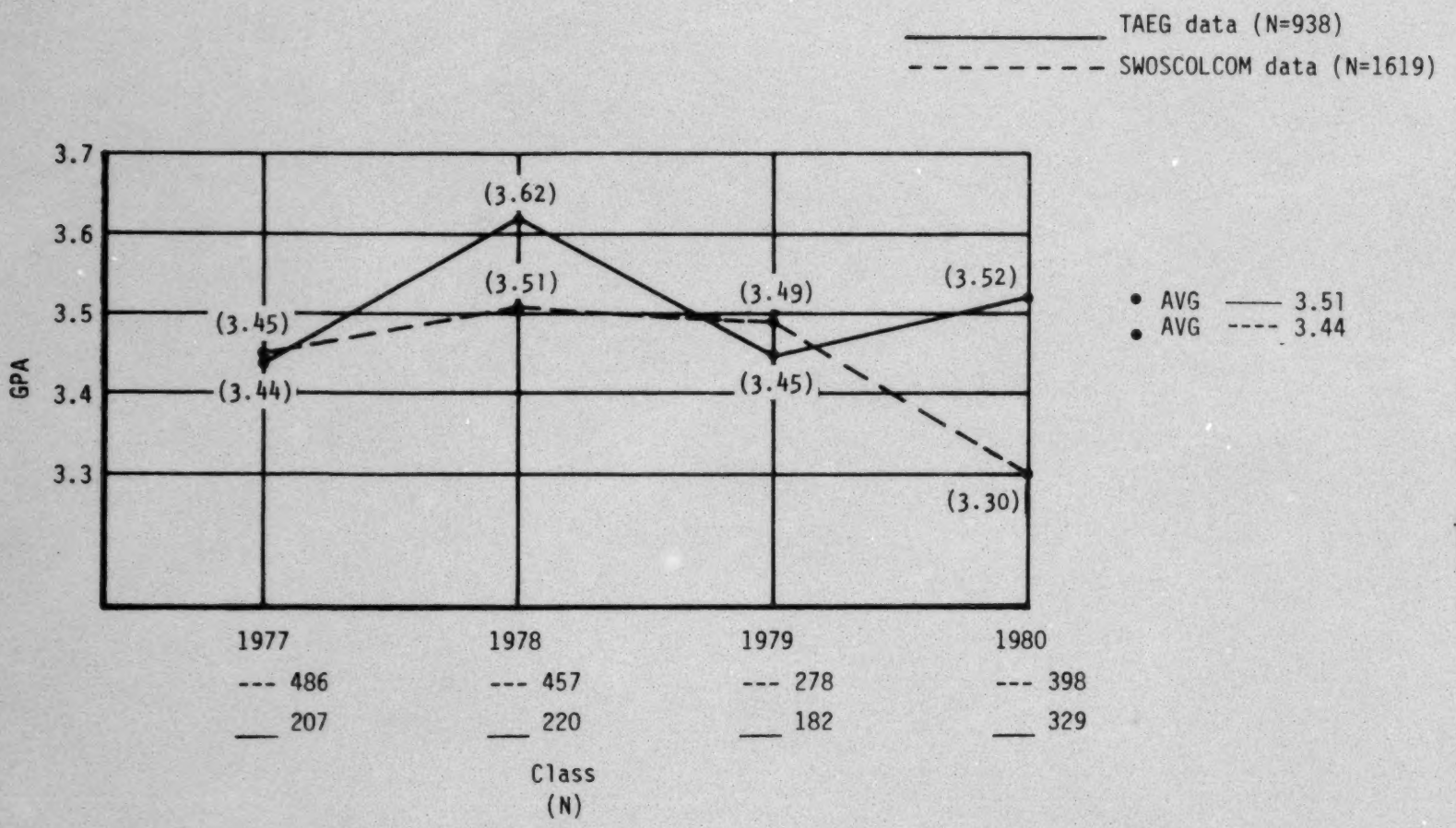


Figure 4. NROTC SWOS Basic Performance Trend as Measured by Year Group

TABLE 6. ATTRITION/SETBACK FOR NROTC GRADUATES BY NROTC UNIT*

| COLLEGE | TOTAL N | NO. ATTRITES | PERCENT | NO. SETBACKS | PERCENT |
|---|---|---|---|---|---|
| CITADEL | 60 | 1 | 1.7 | 7 | 11.7 |
| U COLORADO | 11 | 1 | 9.1 | 1 | 9.1 |
| CORNELL | 18 | | | 1 | 5.5 |
| U FLORIDA | 28 | | | 2 | 7.1 |
| FLORIDA A&M | 21 | | | 4 | 19.0 |
| HOLY CROSS | 17 | 1 | 5.9 | 1 | 5.9 |
| U IDAHO | 14 | 1 | 7.1 | | |
| IOWA ST U | 14 | | | 1 | 7.1 |
| KANSAS | 17 | 1 | 5.9 | 1 | 5.9 |
| MARQUETTE | 23 | | | 2 | 8.7 |
| MIAMI U OHIO | 21 | | | 1 | 4.8 |
| U MISSOURI | 20 | 1 | 5.0 | 2 | 10.0 |
| U NEW MEXICO | 17 | 1 | 5.9 | | |
| U N CAROLINA | 11 | 1 | 9.1 | 1 | 9.1 |
| NORTHWESTERN | 9 | | | 1 | 11.1 |
| OHIO ST. | 17 | | | 2 | 11.8 |
| OKLAHOMA | 9 | | | 1 | 11.1 |
| OREGON ST. | 16 | | | 1 | 6.2 |
| PENN ST. | 46 | | | 1 | 2.2 |
| PRAIRIE VIEW | 16 | 2 | 12.5 | 6 | 37.5 |
| PURDUE | 29 | 4 | 13.8 | | |
| U ROCHESTER | 27 | 1 | 3.7 | | |
| SAVANNAH ST. | 11 | 2 | 18.2 | 5 | 45.4 |
| U S CAROLINA | 40 | 1 | 2.5 | 21 | 52.5 |
| SOUTHERN A&M | 25 | 6 | 24.0 | 8 | 32.0 |
| TEXAS A&M | 33 | | | 2 | 6.1 |
| TEXAS | 25 | 1 | 4.0 | | |
| TULANE | 14 | 1 | 7.1 | | |
| UTAH | 12 | 1 | 8.3 | | |
| VANDERBILT | 24 | | | 2 | 8.3 |
| WASHINGTON | 18 | 1 | 5.6 | 1 | 5.6 |
| SUNY MARITIME | 25 | | | 1 | 4.0 |
| VMI | 25 | 2 | 8.0 | 3 | 12.0 |
| UNKNOWN | 35 | 2 | | 8 | |
| MISSING | 32 | | | 32 | |
| Totals | 1,106 | 32 | 2.89 | 87 | 7.87 |

*Does not include colleges/universities who show neither attrition nor setback.

TABLE 7. ATTRITION/SETBACK FOR NROTC GRADUATES BY CLASS

| CLASS | TOTAL N | NO. ATTRITES | PERCENT | NO. SETBACKS | PERCENT |
|---|---|---|---|---|---|
| 7602 | 50 | | | 2 | 4.0 |
| 7701 | 58 | | | 8 | 13.8 |
| 7702 | 47 | | | 6 | 12.8 |
| 7703 | 58 | | | 22 | 37.9 |
| 7704 | 43 | | | 4 | 9.3 |
| 7705 | 22 | | | 1 | 4.5 |
| 7706 | 53 | | | 1 | 1.9 |
| 7801 | 45 | | | 3 | 6.7 |
| 7802 | 40 | | | 2 | 5.0 |
| 7803 | 33 | | | 4 | 12.1 |
| 7804 | 46 | 1 | 2.2 | 3 | 6.5 |
| 7805 | 33 | 3 | 9.1 | | |
| 7901 | 39 | | | | |
| 7902 | 39 | | | 1 | 2.6 |
| 7903 | 18 | | | 3 | 16.7 |
| 7904 | 68 | 1 | 1.5 | 4 | 5.9 |
| 7905 | 75 | 2 | 2.7 | 3 | 4.0 |
| 7906 | 104 | 4 | 3.8 | 3 | 2.9 |
| 8001 | 98 | 6 | 6.1 | 2 | 2.0 |
| 8002 | 39 | 4 | 10.3 | 6 | 15.4 |
| 8003 | 41 | 1 | 2.4 | 4 | 9.8 |
| 8004 | 51 | | | 5 | 9.8 |
| UNKNOWN | 38 | 10 | 26.3 | | |
| Totals | 1,138 | 32 | 2.8 | 87 | 7.64 |

TABLE 8. ATTRITION/SETBACK FOR NROTC GRADUATES BY MAJOR FIELD OF STUDY*

| CLASS | N | NO. ATTRITES | PERCENT | NO. SETBACKS | PERCENT |
|---|---|---|---|---|---|
| FORESTRY | 3 | 1 | 33.3 | | |
| SCIENCES | 23 | | | 2 | 8.7 |
| BIOL SCI | 13 | | | 1 | 7.7 |
| BACTERIOLOGY | 1 | | | 1 | 100.0 |
| MISC BIOLOGY | 30 | | | 1 | 3.3 |
| METEOROLOGY | 8 | | | 1 | 12.5 |
| CHEMISTRY | 26 | | | 1 | 3.8 |
| MATH | 38 | | | 2 | 5.3 |
| PHYSICS | 16 | | | 2 | 12.5 |
| CIV ENG | 32 | | | 1 | 3.1 |
| COMP SCI | 20 | | | 1 | 5.0 |
| INDUS ENG | 16 | | | 1 | 6.3 |
| CHEM ENG | 29 | | | 1 | 3.4 |
| ELEC ENG | 63 | 2 | 3.2 | 3 | 4.8 |
| MECH ENG | 61 | 2 | 3.3 | 1 | 1.6 |
| ELEX ENG | 3 | | | 1 | 33.3 |
| FOREIGN AFF. | 18 | | | 1 | 5.6 |
| POLY SCI | 75 | | | 3 | 4.0 |
| IND ARTS | 10 | | | 1 | 10.0 |
| HISTORY | 55 | 1 | 1.8 | 2 | 3.6 |
| PSYCHOLOGY | 16 | 1 | 6.3 | 1 | 6.3 |
| ECONOMICS | 32 | | | 2 | 6.3 |
| ACCOUNTING | 9 | | | 1 | 11.1 |
| GEOGRAPHY | 15 | 1 | 6.7 | 1 | 6.7 |
| BUSINESS ADMIN | 98 | 2 | 2.0 | 23 | 23.5 |
| EDUCATION | 12 | | | 2 | 16.7 |
| JOURNALISM | 11 | | | 2 | 18.2 |
| SOC SCI | 14 | 1 | 7.1 | 2 | 14.3 |
| FINE ARTS | 14 | | | 2 | 14.3 |
| ENGLISH | 22 | | | 1 | 4.5 |
| UNKNOWN | 15 | | | 4 | 26.7 |
| Totals | 969 | 11 | 1.1 | 68 | 7.0 |

*Does not include majors that show neither attrition nor setback.

TABLE 9. AVERAGE PRETEST SCORES BY NROTC UNIT

| COLLEGE/UNIVERSITY | MEAN | STD DEV | VARIANCE | N |
|---|---|---|---|---|
| AUBURN | 1.20 | 1.06 | 1.13 | 31 |
| UC BERKELEY | 2.66 | 0.26 | 0.07 | 3 |
| UCLA | 1.74 | 0.96 | 0.93 | 11 |
| CITADEL | 1.60 | 0.94 | 0.88 | 60 |
| U COLORADO | 1.55 | 1.06 | 1.12 | 11 |
| CORNELL | 1.83 | 0.82 | 0.66 | 18 |
| DUKE | 1.70 | 0.81 | 0.66 | 15 |
| U FLORIDA | 1.52 | 0.91 | 0.83 | 28 |
| FLORIDA A&M | 1.36 | 0.98 | 0.96 | 21 |
| GEORGIA TECH | 1.65 | 0.80 | 0.63 | 26 |
| HOLY CROSS | 1.70 | 0.73 | 0.54 | 17 |
| U IDAHO | 1.93 | 0.65 | 0.42 | 14 |
| IIT | 2.16 | 0.39 | 0.15 | 9 |
| U ILLINOIS | 1.64 | 0.88 | 0.78 | 11 |
| IOWA ST | 1.13 | 0.98 | 0.96 | 14 |
| JACKSONVILLE U | 1.16 | 1.03 | 1.06 | 17 |
| U KANSAS | 1.93 | 0.87 | 0.75 | 17 |
| MAINE MARITIME | 2.12 | 0.60 | 0.36 | 18 |
| MARQUETTE | 1.31 | 1.06 | 1.13 | 23 |
| MIT | 2.01 | 0.32 | 0.10 | 7 |
| MIAMI U OHIO | 1.62 | 0.88 | 0.78 | 21 |
| U MICHIGAN | 1.80 | 0.99 | 1.00 | 19 |
| U MINNESOTA | 1.53 | 1.07 | 1.14 | 12 |
| U MISSISSIPPI | 1.35 | 0.85 | 0.72 | 17 |
| U MISSOURI | 1.31 | 0.96 | 0.92 | 20 |
| U NEBRASKA | 2.18 | 0.33 | 0.11 | 7 |
| U NEW MEXICO | 1.90 | 0.59 | 0.34 | 17 |
| U N CAROLINA | 1.86 | 0.43 | 0.18 | 11 |
| NORTHWESTERN | 1.68 | 0.76 | 0.58 | 9 |
| NOTRE DAME | 1.56 | 0.79 | 0.63 | 20 |
| OHIO ST | 1.84 | 0.72 | 0.52 | 17 |
| U OKLAHOMA | 1.06 | 1.00 | 1.01 | 9 |
| OREGON ST | 2.06 | 0.70 | 0.49 | 16 |
| PENN ST | 1.47 | 0.95 | 0.91 | 46 |
| U PENNSYLVANIA | 1.89 | 0.66 | 0.44 | 17 |
| PRAIRIE VIEW | 1.02 | 0.80 | 0.63 | 16 |
| PURDUE | 1.43 | 0.95 | 0.91 | 29 |
| RPI | 1.71 | 0.84 | 0.71 | 32 |
| RICE | 1.75 | 0.38 | 0.14 | 4 |
| U ROCHESTER | 1.44 | 0.93 | 0.86 | 27 |
| SAVANNAH ST | 1.13 | 1.09 | 1.20 | 11 |
| U S CAROLINA | 1.86 | 1.11 | 1.23 | 40 |
| USC | 1.91 | 0.64 | 0.40 | 14 |
| SOUTHERN A&M | 1.59 | 0.75 | 0.57 | 25 |
| TEXAS A&M | 1.57 | 0.96 | 0.92 | 33 |
| TEXAS | 1.44 | 1.01 | 1.02 | 25 |
| TULANE | 2.06 | 0.69 | 0.47 | 14 |
| U UTAH | 1.91 | 0.98 | 0.96 | 12 |
| VANDERBILT | 1.57 | 0.97 | 0.95 | 24 |
| VILLANOVA | 1.17 | 0.92 | 0.85 | 37 |
| U VIRGINIA | 1.90 | 0.71 | 0.50 | 21 |
| U WASHINGTON | 1.86 | 0.77 | 0.59 | 18 |
| U WISCONSIN | 1.20 | 1.11 | 1.22 | 10 |
| SUNY MARITIME | 1.76 | 0.77 | 0.59 | 25 |
| VMI | 1.67 | 0.79 | 0.62 | 25 |
| Average | 1.569 | 0.92 | 0.84 | 1,071 |

been calculated, but because of space constraints, they are not presented here. Table 10 shows the average pretest scores achieved for each of the 21 curricular areas and indicates variability about those scores. Tables 11 and 12 provide AVGPT scores by major field of study and class. Data on NROTC unit performance in specific pretest subject areas were developed but have been retained locally because of space constraints.

**PREPARATION AND PERFORMANCE DIFFERENCES BASED ON TECHNICAL AND NONTECHNICAL MAJOR FIELDS OF STUDY.** A major component of the core curriculum evaluation will focus on identification and assessment of differences in performance, if any, between NROTC graduates who completed technical majors and graduates who completed nontechnical programs of study. During the current study, data were acquired to describe SWOS student performance in terms of this variable. Table 13 and figure 5 summarize these data.

Table 13 shows both technical and nontechnical group GPAs for each of the 21 areas of instruction for both pretest and criterion test administrations. Figure 5 depicts these data graphically. As is evident from these data, the scores of graduates with technical majors were equal to or higher than those of graduates with nontechnical majors on all 21 curricular areas of both PT and CT tests. In pretest performance, the difference in scores between these groups was statistically significant ($p > .01$) for 8 of the 21 units of instruction; statistical significance between group CT scores was found in 13 of the 21 units compared. However, one should use caution in interpreting these findings since absolute differences in average scores may be too small to be of any practical significance.

Table 14 and figures 6 and 7 present variance data. Pretest variances are generally larger than those computed for CT test scores. Within the pretest data, differences in variance between technical and nontechnical majors tend to occur primarily in Engineering/Damage Control areas (units 16-21), but there is no easily interpreted pattern and differences between variances are apparently not significant. For criterion test scores, however, the mean variability of performance for nontechnically trained students is about twice that of students with technical majors ($p > .01$, df = 480). As in pretest scores, nontechnical majors produced a greater variation among CT scores in Engineering/Damage Control areas than did technical majors; differences in CT variance for External Communication (unit 4), Rules of the Road (unit 5), and Navigation (unit 6) were also evident.

Data describing the effect of a technical/nontechnical background on attrition or setback were also acquired for review. Attrite data were not available in sufficient numbers to be useful; a total of only 11 cases was identified for both groups. However, available setback data showed that NROTC graduates with a nontechnical background were more than twice as likely to be set back than were their counterparts from a technical background. Of 509 technically trained students, 20 (3.9 percent) were setback; of 460 nontechnical students, 48 (10.4 percent) were setback. This difference is statistically significant at $p > .001$ level of confidence ($X^2 = 14.69$ with 1 df).

TABLE 10. CURRICULAR AREA AVERAGE PRETEST SCORES

| UNIT NO. | TITLE | AVGPT SCORE (N=1160) | VARIANCE |
|---|---|---|---|
| 1 | Maneuvering Board & Tactics | 1.32 | 1.21 |
| 2 | Watchstanding & Seamanship | 1.94 | 1.71 |
| 3 | CIC Watch Officer | 1.70 | 1.41 |
| 4 | External Communications | 1.24 | .93 |
| 5 | Rules of the Road | 1.45 | 1.28 |
| 6 | Navigation | 1.55 | 1.18 |
| 7 | Naval Ordnance | 1.27 | 1.31 |
| 8 | Anti-Submarine Warfare | 1.11 | 1.22 |
| 9 | Surface Combat Operations | 1.42 | 1.13 |
| 10 | Mine and Amphibious Warfare | 1.37 | 1.11 |
| 11 | Inport Watch Officer | 1.86 | 1.55 |
| 12 | Personnel Organization and Administration | 1.59 | 1.06 |
| 13 | Human Resources Management | 1.92 | 1.57 |
| 14 | Shipboard Training and Administration | 1.59 | 1.20 |
| 15 | Inspections and Safety | 1.34 | 1.24 |
| 16 | Material Management | 1.45 | 1.36 |
| 17 | Steam Propulsion and Auxiliary Systems | 1.66 | 1.36 |
| 18 | Diesel and Gas Turbine Propulsion and Auxiliary Systems | 1.54 | 1.38 |
| 19 | Engineering Administration and Records | 1.73 | 1.40 |
| 20 | Damage Control (I) | 1.58 | 1.22 |
| 21 | Damage Control (II) | 1.78 | 1.57 |

TABLE 11. AVERAGE PRETEST SCORES BY MAJOR FIELD OF STUDY

| MAJOR | MEAN | STD DEV | VARIANCE | N |
|---|---|---|---|---|
| AGRICULT | 1.72 | 0.98 | 0.97 | 5 |
| FORESTRY | 1.21 | 1.09 | 1.18 | 3 |
| MISC AGR | 1.78 | 0.0 | 0.0 | 1 |
| SCIENCES | 1.56 | 0.88 | 0.77 | 23 |
| BIOL SCI | 1.61 | 0.81 | 0.65 | 13 |
| BOTANY | 0.46 | 0.92 | 0.85 | 4 |
| BACTERIO | 0.0 | 0.0 | 0.0 | 1 |
| ZOOLOGY | 1.32 | 0.99 | 0.98 | 7 |
| ETOMOLO | 2.37 | 0.37 | 0.14 | 2 |
| MISC BIO | 1.46 | 1.06 | 1.12 | 30 |
| OPTOMETR | 2.52 | 0.0 | 0.0 | 1 |
| MISC MED | 1.56 | 0.0 | 0.0 | 1 |
| GEOLOGY | 1.80 | 0.87 | 0.75 | 10 |
| NAUT SCI | 2.53 | 0.31 | 0.09 | 3 |
| OPS RSCH | 2.14 | 0.0 | 0.0 | 1 |
| METEORL | 1.45 | 1.27 | 1.61 | 8 |
| CHEMISTRY | 1.75 | 0.82 | 0.67 | 26 |
| BIOCHEM | 1.99 | 0.0 | 0.0 | 1 |
| OCEANOG | 1.33 | 1.13 | 1.27 | 8 |
| METALLUR | 1.20 | 1.70 | 2.89 | 2 |
| MATH | 1.55 | 0.89 | 0.80 | 38 |
| PHYSICS | 1.83 | 0.97 | 0.94 | 16 |
| PHYS SCI | 2.32 | 0.20 | 0.04 | 4 |
| CIV ENG | 1.39 | 0.97 | 0.94 | 32 |
| AGRI ENG | 1.81 | 0.0 | 0.0 | 1 |
| COMP SCI | 1.76 | 0.95 | 0.91 | 20 |
| NAV ARCH | 1.85 | 0.82 | 0.67 | 28 |
| NUC ENG | 1.49 | 0.92 | 0.85 | 26 |
| INDS ENG | 1.94 | 0.85 | 0.72 | 16 |
| CHEM ENG | 1.69 | 0.74 | 0.54 | 29 |
| ELEC ENG | 1.65 | 0.78 | 0.61 | 63 |
| MECH ENG | 1.67 | 0.96 | 0.91 | 61 |
| ELEX ENG | 0.61 | 1.05 | 1.11 | 3 |
| AERO ENG | 2.17 | 0.34 | 0.12 | 8 |
| ARCHITECT | 1.78 | 0.0 | 0.0 | 1 |
| ENGINEER | 1.99 | 0.74 | 0.55 | 20 |
| FRGN AFF | 1.77 | 0.88 | 0.77 | 18 |
| POLY SCI | 1.52 | 0.88 | 0.77 | 75 |
| PUB ADM | 1.70 | 0.71 | 0.51 | 5 |
| INDS ART | 1.23 | 1.07 | 1.14 | 10 |
| HISTORY | 1.54 | 0.90 | 0.81 | 55 |
| INDS MGT | 1.63 | 0.0 | 0.0 | 1 |
| PERS ADM | 2.08 | 0.39 | 0.15 | 2 |
| PSYCHOL | 1.82 | 0.78 | 0.61 | 16 |
| ANTHROPL | 2.10 | 0.56 | 0.31 | 2 |
| ARCHEOL | 2.53 | 0.0 | 0.0 | 1 |
| ECONOMICS | 1.54 | 0.91 | 0.83 | 32 |
| ACCOUNTG | 1.51 | 0.61 | 0.38 | 9 |
| GEOGRAPH | 1.79 | 0.99 | 0.98 | 15 |
| BUS ADM | 1.31 | 1.01 | 1.01 | 98 |
| FINANCE | 1.66 | 0.72 | 0.52 | 8 |
| PHYS ED | 1.30 | 1.09 | 1.19 | 4 |
| EDUCATION | 1.74 | 0.90 | 0.82 | 12 |
| JOURNL | 1.69 | 0.75 | 0.56 | 11 |
| SOC SCI | 1.35 | 1.12 | 1.27 | 14 |
| FINE ARTS | 0.72 | 0.89 | 0.79 | 14 |
| ENGLISH | 1.71 | 0.81 | 0.65 | 20 |
| LANGUAGE | 1.77 | 0.77 | 0.60 | 8 |
| PHILOSOPHY | 1.64 | 0.29 | 0.08 | 3 |
| NOT ELSEWHERE CLASSIFIED | 1.38 | 0.89 | 0.79 | 15 |
| Average | 1.58 | 0.91 | 0.84 | 966 |

TABLE 12. AVERAGE PRETEST SCORES BY CLASS

| CLASS | MEAN | STD DEV | VARIANCE | N |
|---|---|---|---|---|
| 7602 | 1.48 | 0.51 | 0.28 | 50 |
| 7701 | 1.20 | 0.85 | 0.73 | 58 |
| 7702 | 0.20 | 0.52 | 0.27 | 47 |
| 7703 | 0.15 | 0.45 | 0.21 | 58 |
| 7704 | 0.27 | 0.60 | 0.33 | 43 |
| 7705 | 1.80 | 0.42 | 0.17 | 22 |
| 7706 | 1.50 | 0.92 | 0.84 | 53 |
| 7801 | 1.80 | 0.66 | 0.44 | 45 |
| 7802 | ( NO DATA ) | | - | (40) |
| 7803 | 1.59 | 0.93 | 0.86 | 33 |
| 7804 | 2.05 | 0.42 | 0.18 | 46 |
| 7805 | 1.87 | 0.71 | 0.50 | 33 |
| 7901 | 1.96 | 0.74 | 0.55 | 39 |
| 7902 | 1.72 | 0.77 | 0.59 | 39 |
| 7903 | 2.15 | 0.36 | 0.13 | 18 |
| 7904 | 1.92 | 0.75 | 0.56 | 68 |
| 7905 | 2.12 | 0.48 | 0.23 | 75 |
| 7906 | 1.86 | 0.69 | 0.47 | 104 |
| 8001 | 2.06 | 0.49 | 0.24 | 98 |
| 8002 | 1.97 | 0.48 | 0.23 | 39 |
| 8003 | 2.00 | 0.49 | 0.24 | 41 |
| 8004 | 2.04 | 0.49 | 0.24 | 51 |
| MISSING/UNK | 2.17 | 0.30 | 0.09 | 38 |
| Average | 1.60 | 0.92 | 0.85 | 1,098 |

TABLE 13. COMPARISON OF MEANS BETWEEN TECHNICAL AND NONTECHNICAL MAJORS ON SWOS BASIC PRETEST AND CRITERION TESTS

| PRETEST | | UNIT | CRITERION TEST | |
|---|---|---|---|---|
| TECH (N=509) | NONTECH (N=460) | | TECH (N) | NONTECH (N) |
| 1.48 | 1.23* | 1 | 3.58 (481) | 3.45 (426)* |
| 2.20 | 1.88* | 2 | 3.62 (481) | 3.57 (406)* |
| 1.76 | 1.68 | 3 | 3.49 (481) | 3.39 (407)* |
| 1.31 | 1.20 | 4 | 3.56 (457) | 3.48 (375)* |
| 1.52 | 1.45 | 5 | 3.53 (472) | 3.47 (399)* |
| 1.64 | 1.51 | 6 | 3.54 (472) | 3.41 (399)* |
| 1.28 | 1.24 | 7 | 3.52 (477) | 3.49 (402) |
| 1.14 | 1.08 | 8 | 3.49 (469) | 3.46 (397) |
| 1.50 | 1.37 | 9 | 3.59 (475) | 3.40 (392)* |
| 1.45 | 1.34 | 10 | 3.59 (475) | 3.56 (415) |
| 1.96 | 1.82 | 11 | 3.68 (472) | 3.60 (403) |
| 1.64 | 1.53 | 12 | 3.46 (467) | 3.46 (313) |
| 2.04 | 1.88 | 13 | 3.52 (475) | 3.47 (416) |
| 1.66 | 1.54 | 14 | 3.46 (472) | 3.43 (402) |
| 1.44 | 1.27 | 15 | 3.53 (472) | 3.50 (316) |
| 1.58 | 1.38* | 16 | 3.54 (469) | 3.47 (396)* |
| 1.83 | 1.51* | 17 | 3.50 (469) | 3.30 (396)* |
| 1.78 | 1.37* | 18 | 3.50 (474) | 3.34 (402)* |
| 1.85 | 1.63* | 19 | 3.68 (466) | 3.60 (389)* |
| 1.66 | 1.49* | 20 | 3.50 (473) | 3.40 (398)* |
| 1.95 | 1.69* | 21 | 3.56 (467) | 3.47 (389)* |
| 1.660 | 1.498* | AVG | 3.542 (481) | 3.458 (405)* |

*$p > .01$

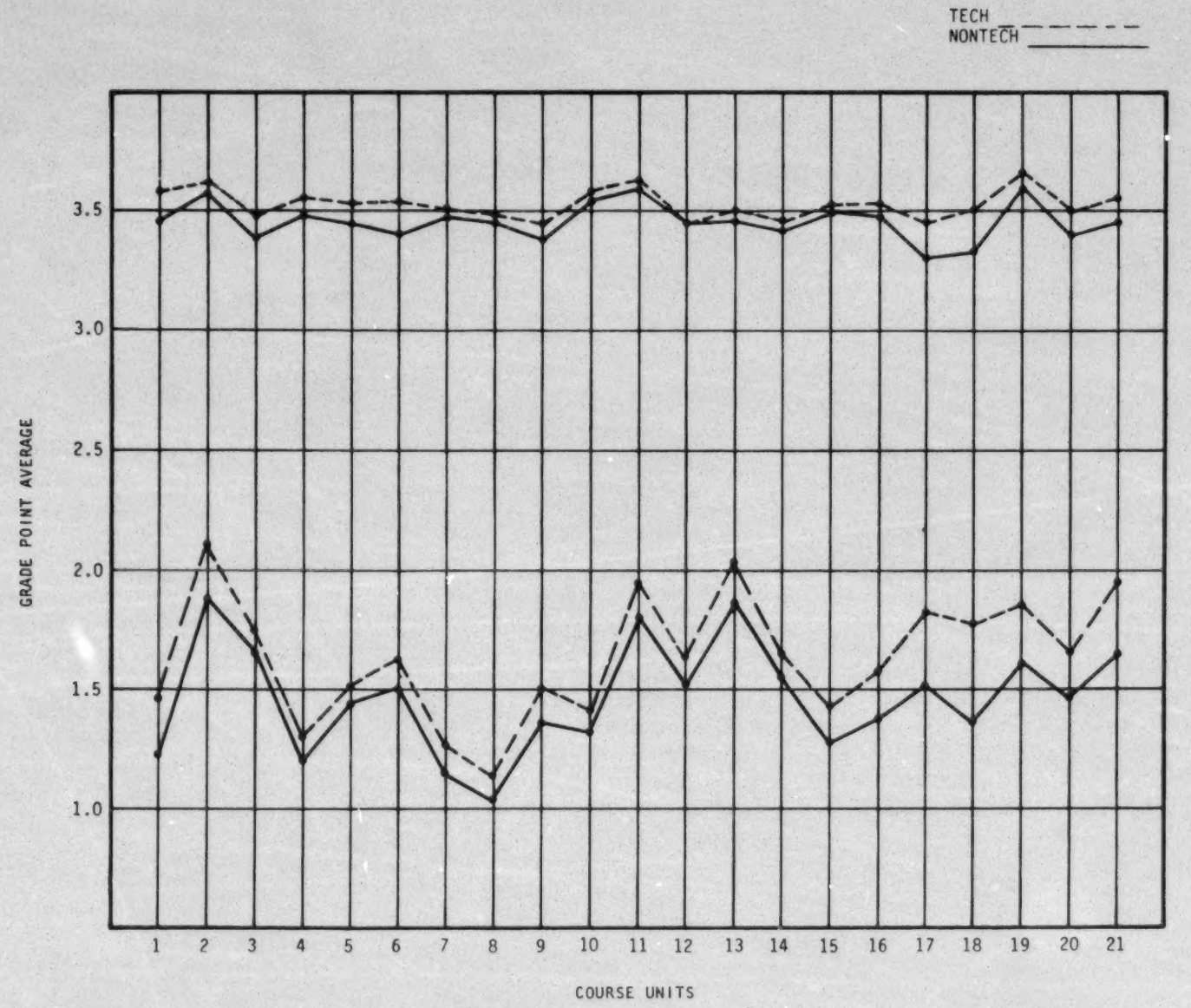


Figure 5. A Graphic Comparison of PT and CT Mean GPAs for Technical and Nontechnical Majors

TABLE 14. COMPARISON OF VARIANCE BETWEEN TECHNICAL AND NONTECHNICAL MAJORS USING PRETEST AND CRITERION TEST DATA

| PRETEST | | | UNIT | CRITERION TEST | | |
|---|---|---|---|---|---|---|
| TECH (N=509) | TOTAL (N=969) | NONTECH (N=460) | | TECH (N=481) | TOTAL (N=886) | NONTECH (N=405) |
| 1.32 | 1.24 | 1.12 | 1 | .14 | .16 | .17 |
| 1.64 | 1.73 | 1.81 | 2 | .06 | .06 | .05 |
| 1.37 | 1.41 | 1.45 | 3 | .11 | .11 | .11 |
| .97 | .93 | .89 | 4 | .08 | .10 | .12 |
| 1.29 | 1.27 | 1.26 | 5 | .08 | .09 | .09 |
| 1.14 | 1.19 | 1.24 | 6 | .08 | .10 | .11 |
| 1.31 | 1.31 | 1.31 | 7 | .09 | .10 | .09 |
| 1.18 | 1.20 | 1.23 | 8 | .08 | .08 | .09 |
| 1.13 | 1.14 | 1.14 | 9 | .08 | .09 | .09 |
| 1.08 | 1.12 | 1.16 | 10 | .05 | .06 | .06 |
| 1.50 | 1.55 | 1.60 | 11 | .05 | .05 | .05 |
| .99 | 1.03 | 1.07 | 12 | .06 | .06 | .06 |
| 1.46 | 1.56 | 1.67 | 13 | .08 | .09 | .10 |
| 1.11 | 1.17 | 1.24 | 14 | .07 | .07 | .08 |
| 1.30 | 1.25 | 1.18 | 15 | .08 | .08 | .07 |
| 1.36 | 1.31 | 1.24 | 16 | .06 | .06 | .06 |
| 1.41 | 1.36 | 1.25 | 17 | .10 | .13 | .15 |
| 1.44 | 1.39 | 1.27 | 18 | .09 | .11 | .13 |
| 1.16 | 1.17 | 1.17 | 19 | .04 | .05 | .06 |
| 1.15 | 1.18 | 1.19 | 20 | .06 | .07 | .07 |
| 1.56 | 1.58 | 1.58 | 21 | .07 | .08 | .10 |
| .818 | .836 | .844 | AVG | .179 | .247 | .324 |

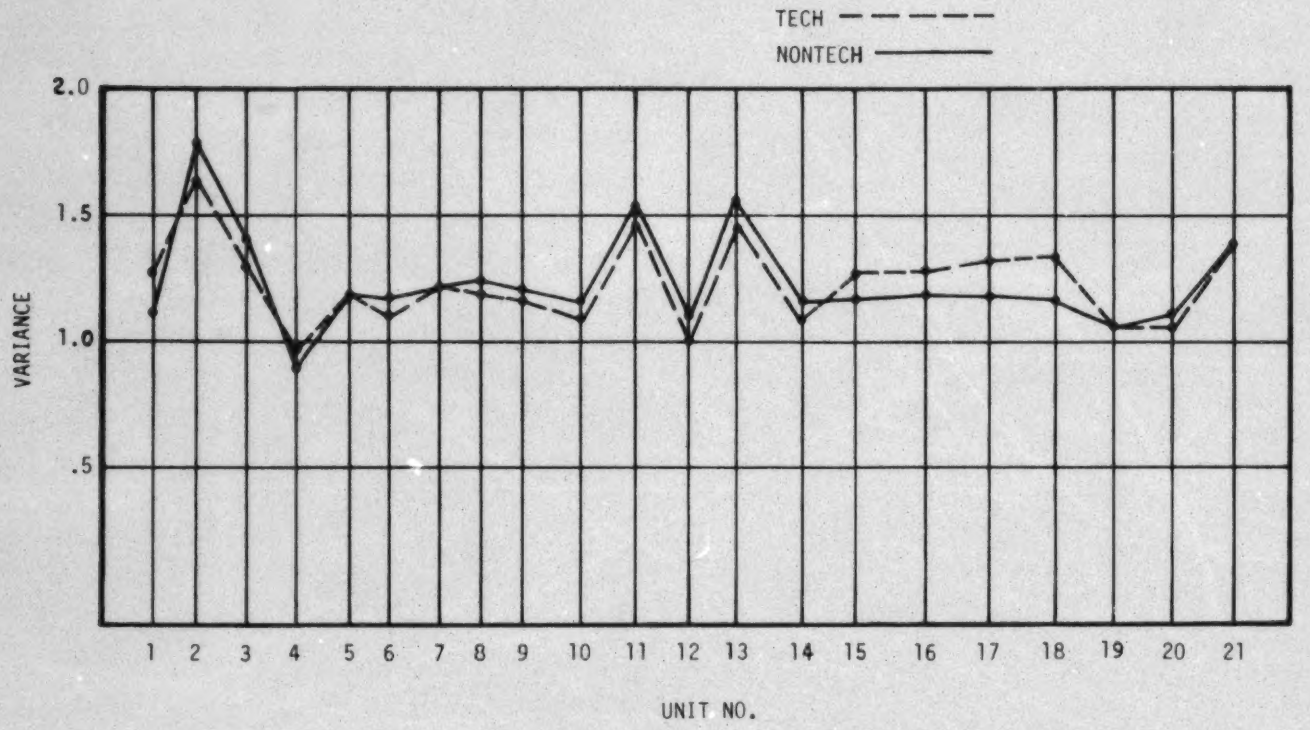


Figure 6. Comparison of Variances of Mean Pretest Scores Between Technical and Nontechnical Majors

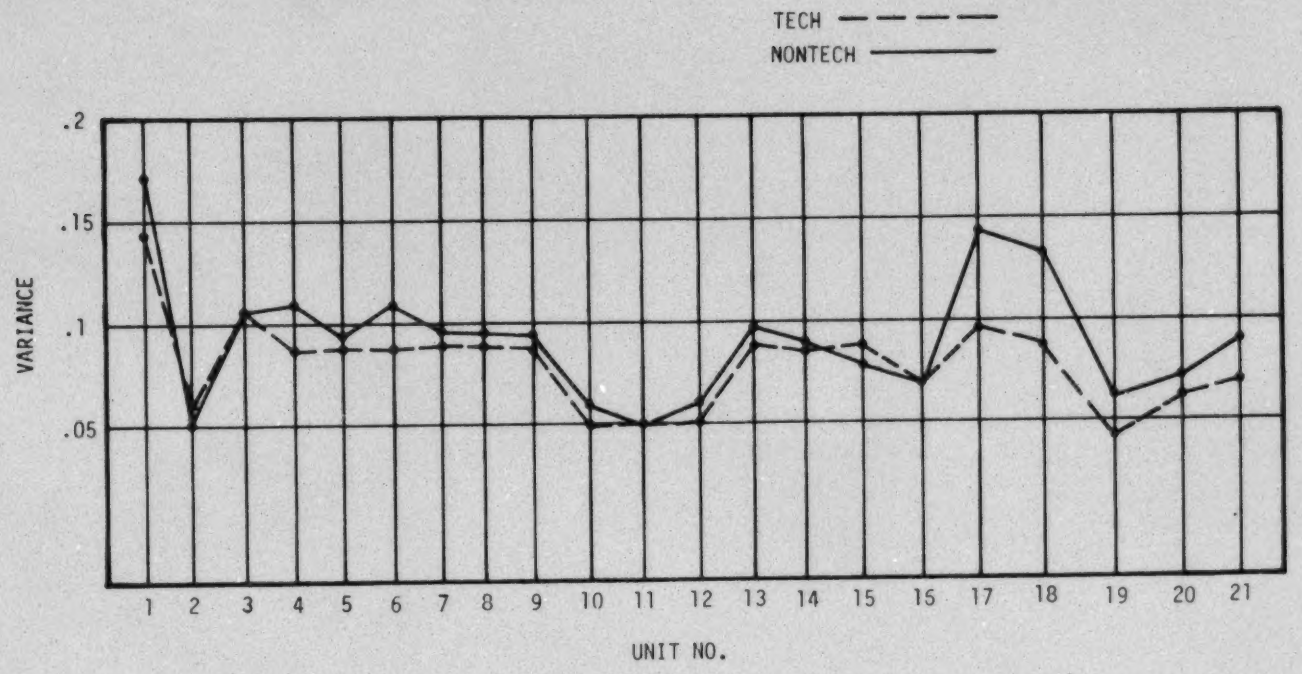


Figure 7. Comparison of Variances of Mean CT Scores Between Technical and Nontechnical Majors

**INSTITUTIONAL VARIABLES.** Average PT and CT scores of NROTC graduates were also computed using institutional characteristics as a means of grouping data. The methodology by which institutions were assigned to specific categories or ratings for each characteristic is described in appendix C. Tables 15 and 16 summarize PT and CT performance data for all categories of each institutional variable.

Differences among category PT mean scores were significant for five of the nine institutional variables. Mean scores of graduates representing different levels of "competitiveness" as defined by Barron's Profiles of American Colleges (1977) were ordered sequentially; graduates of the most competitive institution achieved the highest entering average PT score. Graduates of institutions whose primary focus is on technical preparation achieved significantly better PT scores than did their counterparts from predominately LAS or multi-use university settings, although none of the scores were particularly noteworthy. Significant differences also were found to exist among the categories comprising "size," coeducation," and "salary" variables.

For institutions characterized by "high," "average," or "low" faculty salaries, data showed graduates of institutions rated as "low" in salary did not score as well on entry tests. To verify this relationship, a special variable was defined and institutional assignments made to reflect faculty salary ranks established by the American Association of University Professors. The results of AVGPT scores derived for four categories of this special variable are shown in table 17. Differences between groups (with graduates of lower salaried school faculties scoring lowest) were significant at the $p > .01$ level ($F = 4.366$, $df = 3$).

Significant differences in mean CT scores among categories comprising each institutional characteristic were found for only two variables: (1) the differences in mean scores among the competitive ranks of the Barron's scale continued in essentially the same order and (2) a significant difference in mean CT scores achieved by representatives of predominately minority vs. predominately majority institutions sharpened an obvious but not statistically significant difference found between AVGPT scores. The differences between categories of these two variables were not totally unexpected in that the four institutions having a predominantly minority enrollment are assigned four of the five places that make up the "less competitive" scale ranking. For other variables, no significant differences among category mean scores were found.

Data were also tabulated to describe the relationship of technical or nontechnical background within institutional characteristics. Table 18 summarizes these data tabulations. For only three (salary, control, and ethnic) of the nine institutional descriptors were the obtained frequencies of technical/nontechnical percentages not significantly different ($p > .01$) from expected frequencies. For those six variables demonstrating differences, the difference among college "ranks" may be the most important: it indicates that proportionately more nontechnically-trained students come from lower-ranking institutions.

TABLE 15. AVERAGE PT SCORES GROUPED BY INSTITUTIONAL VARIABLES

| INSTITUTIONAL CHARACTERISTIC | CATEGORY | MEAN PT SCORE (N) | REMARKS |
|---|---|---|---|
| Institutional Rank (Based on entry requirements and proportion of applicants accepted) | Most Competitive | 2.10 (7) | |
| | Highly Competitive | 1.79 (116) | |
| | Very Competitive | 1.69 (241) | $p > .01$ |
| | Competitive | 1.46 (611) | |
| | Less Competitive | 1.45 (90) | |
| | Noncompetitive | 1.93 (41) | |
| Environment | | | |
| | Suburban | 1.55 (537) | Difference not |
| | Urban | 1.57 (475) | statistically |
| | Rural | 1.59 (94) | significant |
| Type | | | |
| | University | 1.53 (859) | $p > .01$ |
| | Technical | 1.80 (142) | |
| | LAS | 1.49 (105) | |
| Faculty Salary | High | 1.59 (454) | |
| | Avg | 1.69 (227) | $p > .01$ |
| | Low | 1.47 (425) | |
| Size | | | |
| | Less than 5K | 1.57 (268) | |
| | Less than 10K | 1.58 (346) | |
| | Less than 15K | 1.73 (156) | $p > .01$ |
| | Less than 20K | 1.30 (157) | |
| | Greater than 20K | 1.61 (179) | |
| Ethnic Composition | Nonminority | 1.58 (1,033) | Difference not |
| | Minority | 1.33 (73) | statistically significant |
| Coeducation Status | Coed | 1.54 (1,029) | |
| | Male Only | 1.86 (77) | $p > .01$ |
| Geographic Location | NE | 1.62 (244) | |
| | W | 1.64 (228) | Difference not |
| | MW | 1.59 (228) | statistically |
| | SE | 1.47 (406) | significant |
| Control | | | |
| | Public | 1.56 (861) | Difference not |
| | Private | 1.73 (148) | statistically |
| | Catholic | 1.38 (97) | significant |
| | Mean AVGPT | 1.56 (1,106) | |

TABLE 16. PERFORMANCE CT SCORES BY INSTITUTIONAL VARIABLES

| INSTITUTIONAL CHARACTERISTIC | CATEGORY | MEAN CT SCORE (N) | REMARKS |
|---|---|---|---|
| Rank (Based on entry requirements and proportion of applicants accepted) | Most Competitive | 3.60 (7) | |
| | Highly Competitive | 3.61 (110) | |
| | Very Competitive | 3.53 (227) | |
| | Competitive | 3.48 (538) | |
| | Less Competitive | 3.37 (66) | $p > .01$ |
| | Noncompetitive | 3.44 (39) | |
| Environment | Suburban | 3.49 (478) | Difference not statistically significant |
| | Urban | 3.50 (421) | |
| | Rural | 3.50 (89) | |
| Type | University | 3.48 (761) | Difference not statistically significant |
| | Technical | 3.57 (137) | |
| | LAS | 3.51 (90) | |
| Faculty Salary | High | 3.51 (418) | Difference not statistically significant |
| | Avg | 3.54 (213) | |
| | Low | 3.45 (357) | |
| Size | Less than 5K | 3.51 (238) | Difference not statistically significant |
| | Less than 10K | 3.52 (315) | |
| | Less than 15K | 3.50 (148) | |
| | Less than 20K | 3.47 (125) | |
| | Greater than 20K | 3.45 (162) | |
| Ethnic Composition | Nonminority | 3.51 (939) | $p > .01$ |
| | Minority | 3.30 (49) | |
| Coeducational Status | Coed | 3.49 (914) | Difference not statistically significant |
| | Male Only | 3.56 (74) | |
| Geographic Location | NE | 3.55 (230) | Difference not statistically significant |
| | W | 3.46 (212) | |
| | MW | 3.48 (211) | |
| | SE | 3.49 (335) | |
| Control | Public | 3.49 (761) | Difference not statistically significant |
| | Private | 3.52 (139) | |
| | Catholic | 3.50 (88) | |
| | Mean CT | 3.50 (988) | |

TABLE 17. AVERAGE PT SCORES ACHIEVED BY GRADUATES AS A FUNCTION OF AAUP FACULTY SALARY LEVELS

| SALARY LEVEL | AVGPT MEAN | VARIANCE | N |
|---|---|---|---|
| *Top 20% | 1.73 | .67 | 251 |
| 20-40% | 1.57 | .82 | 410 |
| 40-60% | 1.47 | .99 | 200 |
| 60-80% | 1.46 | .88 | 245 |
| Totals Average | 1.56 | .84 | 1106 |

*Includes institutions listed separately in top 5 percent.

TABLE 18. TABULATIONS OF INSTITUTIONAL CHARACTERISTICS BY TECHNICAL/NONTECHNICAL PREPARATION

| INSTITUTIONAL CHARACTERISTIC | CATEGORY | PERCENT OF TECHNICAL(N=509)/ NONTECHNICAL (N=460) | REMARKS |
|---|---|---|---|
| Rank | Most Competitive | 85.7/14.3 (7) | |
| | Highly Competitive | 66.7/33.3 (102) | |
| | Very Competitive | 57.7/42.3 (215) | $p > .01$ |
| | Competitive | 49.1/50.9 (540) | |
| | Less Competitive | 43.5/56.5 (69) | |
| | Noncompetitive | 44.4/55.6 (36) | |
| Environment | Suburban | 48.2/51.8 (461) | |
| | Urban | 54.5/45.5 (422) | $p > .01$ |
| | Rural | 66.3/33.7 (86) | |
| Type | University | 48.7/51.3 (747) | |
| | Technical | 78.6/21.4 (131) | $p > .01$ |
| | LAS | 46.2/53.8 (91) | |
| Salary | High | 52.4/47.6 (397) | |
| | Medium | 60.5/39.5 (205) | |
| | Low | 48.2/51.8 (367) | |
| Control | Public | 52.6/47.4 (761) | |
| | Private | 59.1/40.9 (127) | |
| | Catholic | 42.0/58.0 (81) | |
| Geography | NE | 62.9/37.1 (213) | |
| | W | 47.3/52.7 (205) | $p > .01$ |
| | MW | 54.1/45.9 (196) | |
| | SE | 48.5/51.5 (335) | |
| Ethnic | Nonminority | 53.0/47.0 (914) | |
| | Minority | 45.5/54.5 (55) | |
| Coed | Yes | 51.1/48.9 (898) | $p > .01$ |
| | Male | 70.4/29.6 (71) | |
| Size | Less than 5K | 59.3/40.7 (236) | |
| | Less than 10K | 54.9/45.1 (295) | |
| | Less than 15K | 51.4/48.6 (140) | $p > .01$ |
| | Less than 20K | 40.9/59.1 (137) | |
| | Greater than 20K | 49.1/50.9 (161) | |

Other items of interest suggested by a comparison of technical/nontechnical frequencies for institutional variables were:

- rural institutions tend to produce a higher proportion of technical graduates
- LAS-oriented institutions produce technical and nontechnical graduates in roughly the same proportion as do universities; technical institutions, of course, produce a preponderance of technically trained graduates
- the West, Midwest, and Southeast were about evenly split in their production of technical and nontechnical graduates; however, more than 60 percent of the graduates from institutions in the Northeast were technically trained
- differences in frequency of technical graduates as a function of institution size were significant; however, the data do not show any consistent pattern that should be explored.

Attrite and setback percentages for each of the various categories within institutional characteristics were also tabulated. The variables "size," "environment," and "coeducational status" exhibited percentages of setbacks and attrites similar to those exhibited by the total sample; similarly, obtained values for institutional "type," "salary," "methods of control," and "geographic location" approximated the mean percentage of attrites. However, the frequency of attrites/setbacks for "institutional ranking" and "ethnic composition" categories differed significantly for both criteria, and "salary," "method of control," and "geography" variables provided different setback ratios than those of the group as a whole.

Table 19 shows attrition and setback percentages by category for institutional characteristics. Both attrite and setback percentages describing "rank" and "ethnic composition" variables were different from mean ratios. For "rank," the less competitive the institution, the greater the percentage of attrites or setbacks; for "ethnic," institutions whose student populations are predominately minority showed higher attrition/setback. These findings are mutually supportable in that four of the five institutions comprising the "less competitive" category enroll predominately minority students. Among other institutional characteristics, significant differences between the percentages of attrites or setbacks expected and those observed were not found, although some differences were observed. A tabulation of setbacks by salary levels showed that institutions characterized by relatively low faculty salaries produced three times the number of setbacks of the other categories under this variable. Public institutions also demonstrated a setback rate three times greater than private or catholic institutions. Significant differences based on geographic location, size, and type were also obtained for attrition/setback percentages.

TABLE 19. TABULATION OF ATTRITION/SETBACK FREQUENCIES BY INSTITUTIONAL CHARACTERISTICS (N=1,106)

| INSTITUTIONAL CHARACTERISTIC | CATEGORY | ATTRITION (N=32) Number/% | SETBACK (N=87) Number/% |
|---|---|---|---|
| Rank | Most Competitive | 0/0 | 0/0 |
| | Highly Competitive | 0/0 | 2/1.7 |
| | Very Competitive | 5/2.1 | 6/2.5 |
| | Competitive | 15/2.5 | 53/8.7 |
| | Less Competitive | 11/12.2* | 23/25.6* |
| | Noncompetitive | 1/2.4 | 3/7.3 |
| Environment | Suburban | 21/3.9 | 39/7.3 |
| | Urban | 8/1.7 | 41/8.6 |
| | Rural | 3/3.2 | 7/7.4 |
| Type | University | 26/3.0 | 0/8.1 |
| | Technical | 2/1.4 | 4/2.8 |
| | LAS | 4/3.8 | 13/12.4 |
| Salary | High | 11/2.4 | 20/4.4 |
| | Medium | 3/1.3 | 11/4.8 |
| | Low | 18/4.2 | 56/13.2* |
| Control | Public | 29/3.4 | 81/9.4* |
| | Private | 2/1.4 | 3/2.0 |
| | Catholic | 1/1.0 | 3/3.1 |
| Geography | NE | 2/.8 | 4/1.6 |
| | W | 9/3.9 | 15/6.6 |
| | MW | 6/2.6 | 10/4.4 |
| | SE | 15/3.7 | 58/14.3* |
| Ethnic* | Nonminority | 22/2.2 | 64/6.2 |
| | Minority | 10/13.7* | 23/31.5* |
| Coed | Coed | 30/2.9 | 83/8.1 |
| | Male | 2/2.6 | 4/5.2 |
| Size | Less than 5K | 8/3.0 | 29/10.8 |
| | Less than 10K | 10/2.9 | 15/4.3 |
| | Less than 15K | 2/1.3 | 11/7.1 |
| | Less than 20K | 5/3.2 | 26/16.6* |
| | Greater than 20K | 7/3.9 | 6/3.4 |

*$p > .01$

## SECTION IV

## NROTC GRADUATE PERFORMANCE AT SUPPLY CORPS SCHOOL

### SYNOPSIS

In the Supply Corps School Basic Qualification Course (BQC), a sample of 490 NROTC graduates achieved a mean grade point average of 88.65 (100 point scale; passing score = 75) during the period FY 1976-1979. This GPA placed 49.2 percent of NROTC graduates in the top half of the BQC when compared to graduates from all accession sources. Reading test scores showed an average grade level achievement of 14.77.

GPA and reading test scores of students classified by technical or nontechnical major were not significantly different. Class standings were achieved as follows: 54.1 percent of technical majors (N = 93) stood in the top half of their class; 49.1 percent of nontechnical majors (N = 391) achieved that same level of performance.

Among institutional characteristics reviewed, the rank order of categories classified on the basis of Barron's competitive criteria was sequential (i.e., those from the highest rank attained the highest GPA), but these differences in GPA were not statistically significant. Similarly, although differences did occur between institutions grouped by predominate ethnic and sex composition, these were not significant probably because of the low Ns in the samples. Multiversity NROTC graduates and NROTC graduates from private institutions did produce significantly higher GPAs than did graduates from other categories of these two institutional variables.

Insufficient attrition and/or setback data were available to permit use of these data for performance assessment or for comparison between subgroups.

### INTRODUCTION

NROTC graduates who are commissioned Supply Corps Officers receive initial, post-baccalaureate preparation for this staff corps through the Basic Qualification Course (BQC), Navy Supply Corps School, Athens, Georgia. The BQC provides job-related instruction in each of the major areas to which a supply officer may be assigned for his/her initial tour of duty.

The BQC curriculum consists of (1) a set of instructional units that comprise a core knowledge requirement for all students and (2) additional specialized instructional units. All students complete the core requirement and after receiving notification of their prospective assignment, complete additional preparation in those special instruction units that correspond to prospective billet assignment. Table 20 identifies the units which make up the required core and lists the six areas for which additional instructional units have been prepared.

TABLE 20. BQC CORE UNITS AND AREAS OF SPECIALIZATION

CORE REQUIREMENTS

| UNIT | TITLE |
|---|---|
| 1 | DISBURSING MANAGEMENT |
| 2 | SUPPLY MANAGEMENT |
| 3 | LEADERSHIP AND MANAGEMENT |
| 4 | RACE RELATIONS |
| 5 | AUTOMATIC DATA PROCESSING |
| 6 | (MARINE CORPS OFFICERS ONLY) |
| 7 | FOOD SERVICE |
| 8 | RETAIL OPERATIONS |

| Specialization Area | Emphasis Units |
|---|---|
| Submarine | 2,3,7 |
| Mechanized Stores | 3,5, Mechanized Supply* |
| Mechanized Stores (Aviation) | 3,5, Mechanized Supply*, Aviation Supply* |
| Assistant Supply, Service | 1,3,7,8 |
| Independent Supply Duty | 1,2,3,7,8 |
| Line Transferees | 1,2,3,7 |

*Units applicable only to specialized area shown.

The Core portion of the curriculum lasts approximately 15 weeks; specialization training for prospective billets may require up to 10 additional weeks. Achievement of course objectives are evaluated by means of objective examinations graded on a scale of 1 - 100. All end-of-course objectives must be attained while maintaining a grade average of 75.

To derive a final performance grade in the BQC, units in the core portion of the curriculum are weighted and averaged to obtain a cumulative score for that part of the curriculum; units of instruction that make up a specialization area are weighted equally and averaged to obtain a cumulative grade for the specialized instruction. A final course grade is computed by averaging the cumulative core and specialization area grades.

The data set, which forms the basis for the evaluation of NROTC graduate performance at BQC, consists of the variables identified in section II of this report with the following modifications:

- A reading score, based on administration of the California (series) Reading Test at entry into BQC, was obtained for most students in the sample. Scores on this test represent reading and comprehension ability measures and are expressed in academic years; the maximum score is 16.

- Entering students at BQC are asked to estimate their overall college grade point average; this score was also obtained for most students in the sample. However, because these scores are only estimates, care must be taken in interpreting any results based on the use of this variable.

Four hundred and ninety cases were acquired for use in assessing performance. These cases include almost all NROTC graduates who attended the BQC during the period 1975 to 1979 for whom data were available.

## PRESENTATION OF DATA

Tables 21, 22, and 23 provide basic descriptive information about NROTC graduate performance at BQC. Table 21 includes the final grade point averages, standard deviations, and variances for students grouped by NROTC unit. The cumulative average grade for the entire sample was 88.65 (S.D. = 4.52, 100 point scale). Tables 22 and 23 provide similar statistics for cases grouped by major field of study (where N is greater than 10) and class year. Figure 8 shows the performance trend indicated by GPA for sequential class years.

Table 24 summarizes mean reading scores grouped by academic year. The average reading score achieved was 14.77 years (S.D. = 1.32; N = 256). Mean reading scores, grouped by undergraduate institution, ranged from 12.72 years to 15.7 years; however, because only a small number of cases represented each school (N = 1 through 9), these scores have not been displayed in this report.

TABLE 21. SUPPLY BASIC QUALIFICATION COURSE MEAN GPA BY NROTC UNIT

| INSTITUTION | MEAN | STD DEV | VARIANCE | N |
|---|---|---|---|---|
| AUBURN | 88.78 | 7.23 | 52.24 | 4 |
| UCLA | 89.01 | 4.26 | 18.11 | 10 |
| CITADEL | 86.06 | 4.16 | 17.30 | 17 |
| U COLORADO | 93.10 | 2.96 | 8.78 | 2 |
| CORNELL | 86.54 | 3.01 | 9.04 | 4 |
| DUKE | 91.87 | 4.20 | 17.61 | 10 |
| U FLORIDA | 87.56 | 6.02 | 36.22 | 6 |
| FLORIDA A&M | 85.82 | 7.65 | 58.45 | 5 |
| GEORGIA TECH | 85.67 | 5.61 | 31.47 | 10 |
| HOLY CROSS | 88.55 | 1.57 | 2.48 | 7 |
| U IDAHO | 87.66 | 3.32 | 11.00 | 10 |
| U ILLINOIS | 90.68 | 0.0 | 0.0 | 1 |
| IOWA ST | 88.80 | 4.04 | 16.30 | 11 |
| JACKSONVILLE U | 85.50 | 4.25 | 18.10 | 9 |
| U KANSAS | 85.31 | 2.74 | 7.49 | 5 |
| MARQUETTE | 92.05 | 4.80 | 23.01 | 7 |
| MIAMI U OHIO | 89.54 | 4.62 | 21.34 | 9 |
| U MICHIGAN | 89.72 | 6.94 | 48.13 | 4 |
| U MINNESOTA | 89.42 | 0.36 | 0.13 | 3 |
| U MISSISSIPPI | 86.90 | 2.51 | 6.30 | 11 |
| U MISSOURI | 92.74 | 4.25 | 18.10 | 4 |
| U NEBRASKA | 90.57 | 2.11 | 4.44 | 5 |
| U NEW MEXICO | 89.36 | 4.62 | 21.31 | 6 |
| U N CAROLINA | 90.48 | 3.77 | 14.23 | 7 |
| NORTHWESTERN | 90.80 | 3.98 | 15.87 | 4 |
| NOTRE DAME | 87.82 | 2.87 | 8.26 | 13 |
| OHIO ST | 88.59 | 5.21 | 27.10 | 14 |
| U OKLAHOMA | 88.74 | 1.45 | 2.10 | 4 |
| OREGON ST | 88.51 | 3.88 | 15.09 | 7 |
| PENN ST | 88.85 | 4.13 | 17.03 | 16 |
| U PENNSYLVANIA | 92.79 | 5.41 | 29.28 | 4 |
| PRAIRIE VIEW | 87.07 | 5.71 | 32.66 | 7 |
| PURDUE | 89.68 | 3.94 | 15.54 | 4 |
| RPI | 89.69 | 4.04 | 16.36 | 6 |
| RICE | 90.51 | 2.53 | 6.42 | 3 |
| U ROCHESTER | 91.07 | 3.21 | 10.29 | 12 |
| SAVANNAH ST | 82.40 | 0.0 | 0.0 | 1 |
| U S CAROLINA | 87.42 | 5.41 | 29.24 | 11 |
| USC | 96.08 | 1.31 | 1.71 | 2 |
| SOUTHERN A&M | 84.50 | 3.70 | 13.72 | 3 |
| TEXAS A&M | 89.47 | 1.93 | 3.72 | 10 |
| TEXAS | 91.02 | 2.69 | 7.24 | 3 |
| TULANE | 89.74 | 5.59 | 31.28 | 6 |
| U UTAH | 88.66 | 0.87 | 0.76 | 3 |
| VANDERBILT | 91.79 | 4.56 | 20.77 | 11 |
| VILLANOVA | 87.88 | 4.25 | 18.03 | 20 |
| U VIRGINIA | 88.56 | 4.79 | 22.96 | 14 |
| U WASHINGTON | 89.46 | 5.47 | 29.91 | 5 |
| U WISCONSIN | 90.36 | 0.36 | 0.13 | 3 |
| SUNY MARITIME | 86.31 | 0.0 | 0.0 | 1 |
| VMI | 79.80 | 0.11 | 0.01 | 2 |
| Average | 88.63 | 4.54 | 20.57 | 371 |

TABLE 22. BQC PERFORMANCE BY MAJOR FIELD OF STUDY ($N \geq 10$)

| MAJOR | MEAN | STD DEV | VARIANCE | N |
|---|---|---|---|---|
| MISC BIO | 86.60 | 3.72 | 13.88 | 10 |
| MATH | 89.14 | 4.01 | 16.11 | 22 |
| COMP SCI | 89.48 | 3.85 | 14.81 | 13 |
| POLY SCI | 89.04 | 5.15 | 26.52 | 23 |
| HISTORY | 87.59 | 4.18 | 17.43 | 26 |
| INDS MGT | 85.58 | 5.82 | 33.84 | 11 |
| PSYCHOL | 90.79 | 3.13 | 9.81 | 11 |
| ECONOMICS | 88.92 | 4.75 | 22.58 | 46 |
| ACCOUNTG | 89.31 | 4.37 | 19.12 | 59 |
| BUS ADM | 88.50 | 4.25 | 18.23 | 133 |
| FINANCE | 89.07 | 2.74 | 7.49 | 13 |
| ENGLISH | 87.20 | 4.26 | 18.19 | 10 |
| Average | 88.53 | 4.51 | 20.34 | 378 |

TABLE 23. BQC PERFORMANCE BY CLASS YEAR

| CLASS YEAR | MEAN GPA | STD DEV | VARIANCE | N |
|---|---|---|---|---|
| 1975 | 88.96 | 4.75 | 22.53 | 94 |
| 1976 | 87.87 | 4.06 | 16.51 | 102 |
| 1977 | 89.17 | 3.97 | 15.77 | 97 |
| 1978 | 86.59 | 8.03 | 64.52 | 78 |
| 1979 | 88.77 | 4.50 | 20.25 | 78 |
| Average | 88.41 | 5.19 | 26.91 | 449 |

TABLE 24. NROTC MEAN READING SCORES BY ACADEMIC YEAR

| YEAR | MEAN | S.D. | VARIANCE | N |
|---|---|---|---|---|
| 1979 | 14.93 | .90 | .803 | 76 |
| 1978 | 14.82 | .95 | .911 | 76 |
| 1977 | 14.59 | 1.78 | 3.18 | 99 |

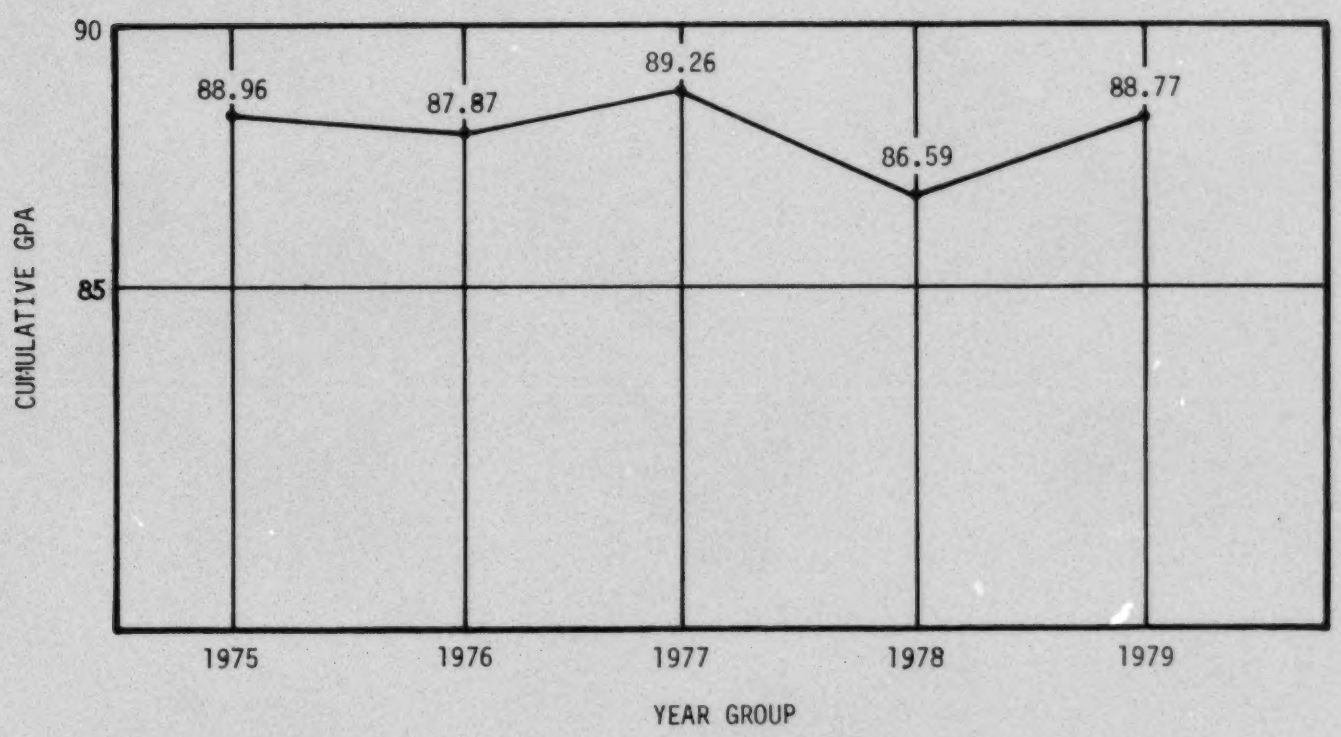


Figure 8. Performance Trend as Indicated by Sequential Class/Years

Reading scores were also grouped by major field of study. Again, the small number of cases representative of each category do not justify their being included in this report. The data are on file in the TAEG MIS and are available through the NROTC program manager.

A summary of student reported college undergraduate GPAs by class year is presented in table 25. The overall college GPA was 2.97 (S.D. = .467; N=489). Again, however, because of small Ns and a lack of control in data acquisition, data describing college GPA by institution and major are not presented.

Using GPA as the indicator of performance, table 26 and figures 9 and 10 depict class standing of NROTC graduates in the BQC. The upper and lower limits of each decile were derived from data from all accession sources, but table 26 only shows NROTC number and percentages in each decile by class year. Figure 9 shows performance trends for the top 20 percent, the bottom 20 percent, and the top half of each year's cases.

Information describing the standings of graduates grouped by NROTC host institution was also developed. Because of the relatively low number of cases available for each school, these data have not been included in the report.

Attrition and setback data for BQC were insufficient for use as performance indicators. Only two attrites and nine setbacks were identified among all cases reviewed.

**PERFORMANCE DIFFERENCES BASED ON TECHNICAL AND NONTECHNICAL MAJORS.** The duties incumbent in Supply Officer billets involve logistics, material purchase, payroll and finance, and/or similar tasks often related to the general area of business administration. These duties normally do not require technical preparation, but both technical and nontechnical backgrounds are found among NROTC graduates assigned to the BQC. It is, therefore, appropriate that performance differences, if any, characteristic of a technical preparation be identified.

A comparison of mean GPAs and reading levels achieved by each of these two groups shows no significant difference in performance:

| | Technical Background | Nontechnical Background |
|---|---|---|
| GPA | 88.506 (N = 97) | 88.554 (N = 387) |
| Reading | 14.859 (N = 68) | 14.809 (N = 181) |

A breakdown of performance by standing (rank in class) is shown in table 27. Among NROTC graduates, 54.1 percent (N=98) of technical majors were in the top half of their classes; 49.1 percent (N=391) of nontechnical majors were among the top 50 percent of their peers.

TABLE 25. MEAN UNDERGRADUATE COLLEGE GPA BY CLASS YEAR*

| YEAR | MEAN | S.D. | VARIANCE | N |
|---|---|---|---|---|
| 1975 | 3.05 | .42 | .169 | 96 |
| 1976 | 2.92 | .47 | .219 | 102 |
| 1977 | 3.00 | .60 | .367 | 101 |
| 1978 | 2.93 | .46 | .214 | 78 |
| 1979 | 2.87 | .47 | .225 | 78 |

*Data provided by students.

TABLE 26. CLASS STANDING BY GPA FOR NROTC GRADUATES

| | DECILE N/% | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Class (N) | TOP 10% | 2nd | 3rd | 4th | 5th | 6th | 7th | 8th | 9th | BOTTOM 10% |
| 1975 (94) | 8/8.5 | 10/10.6 | 11/11.7 | 8/8.5 | 11/11.7 | 14/14.9 | 10/10.6 | 8/8.5 | 5/5.3 | 9/9.6 |
| 1976 (102) | 5/4.9 | 6/5.9 | 12/11.8 | 7/6.9 | 11/10.8 | 14/13.7 | 10/9.8 | 12/11.8 | 14/13.7 | 11/10.8 |
| 1977 (97) | 3/3.1 | 14/14.4 | 15/15.5 | 8/8.2 | 15/15.5 | 9/9.3 | 8/8.2 | 5/5.2 | 9/9.3 | 11/11.3 |
| 1978 (78) | 10/12.8 | 5/6.4 | 7/9.0 | 5/6.4 | 7/9.0 | 12/5.4 | 4/5.1 | 5/6.4 | 16/20.5 | 7/9.0 |
| 1979 (78) | 8/10.3 | 9/11.5 | 7/9.0 | 9/11.5 | 10/12.8 | 4/5.1 | 6/7.7 | 9/11.5 | 10/12.8 | 6/7.7 |
| TOTALS (449) | 34/7.6 | 44/9.8 | 52/11.6 | 37/8.2 | 54/12.0 | 53/11.8 | 38/8.5 | 39/8.7 | 54/12.0 | 44/9.0 |

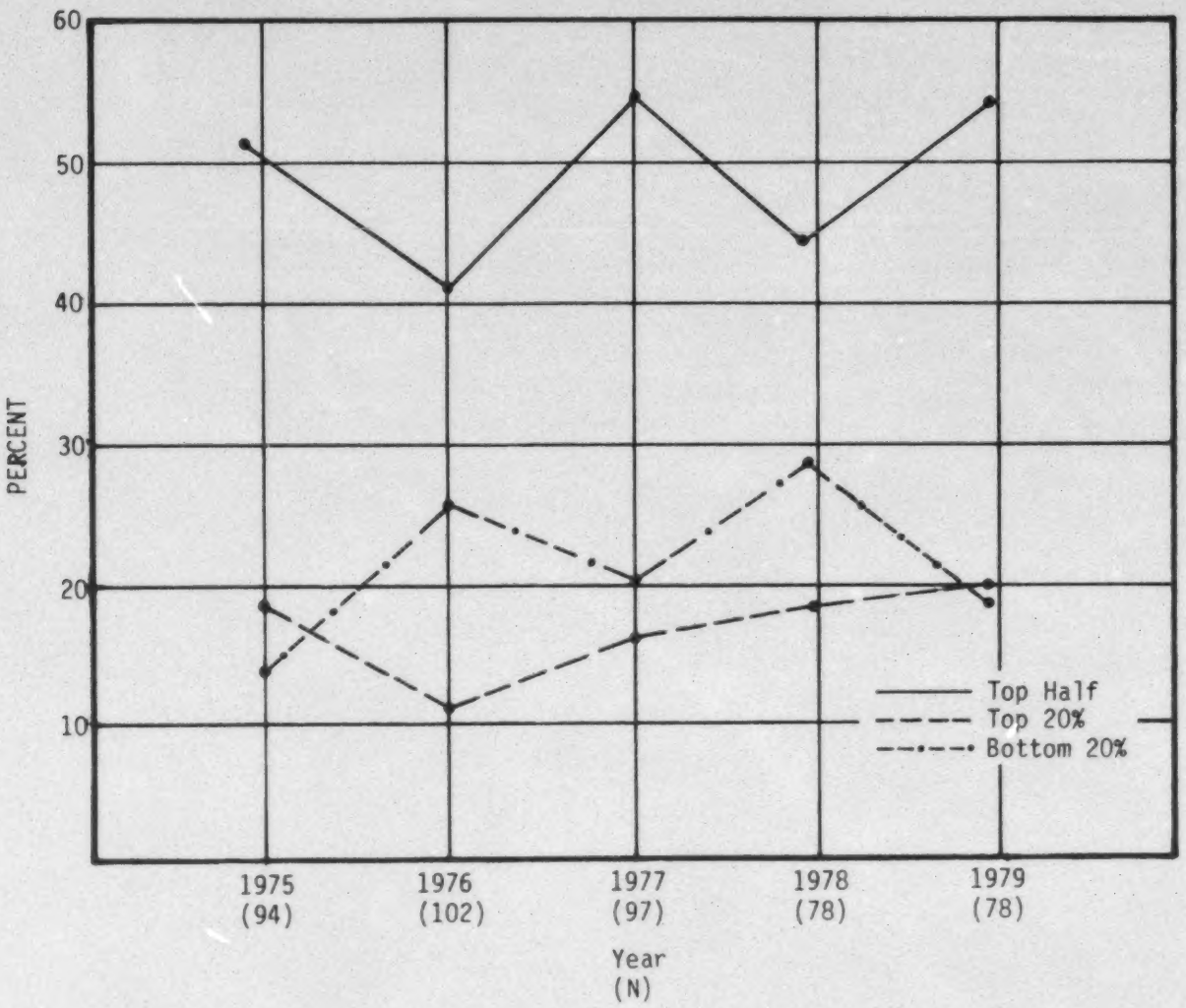


Figure 9. Performance Trend by Class for Top and Bottom 20 Percent of NROTC Graduates

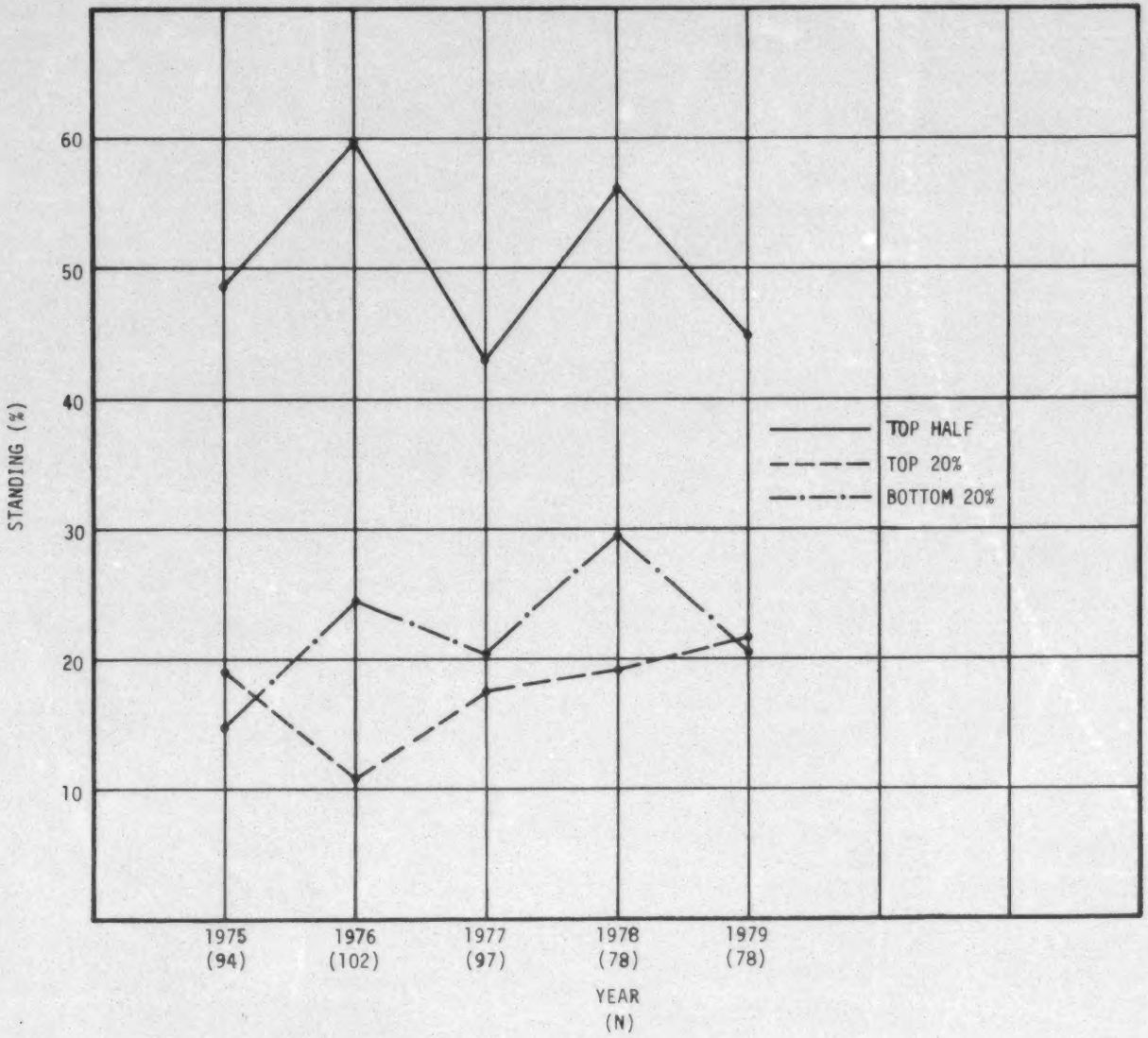


Figure 10. Performance Trend by Class using Rank or Class

TABLE 27. A COMPARISON OF RANK IN CLASS BETWEEN NROTC GRADUATES IN TECHNICAL AND NONTECHNICAL MAJORS

| | CLASS STANDING | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | TOP 10% | 2nd | 3rd | 4th | 5th | 6th | 7th | 8th | 9th | BOTTOM 10% | ROW TOTAL |
| TECHNICAL | 8<br>8.2% | 9<br>9.2% | 11<br>11.2% | 9<br>9.2% | 16<br>16.3% | 12<br>12.2% | 6<br>6.1% | 8<br>8.2% | 11<br>11.2% | 8<br>8.2% | 98<br>20.0% |
| NONTECHNICAL | 31<br>7.9% | 40<br>10.2% | 46<br>11.8% | 29<br>7.4% | 46<br>11.8% | 46<br>11.8% | 33<br>8.4% | 35<br>9.0% | 43<br>11.0% | 42<br>10.7% | 391<br>80.0% |
| TOTAL | 39<br>8.0% | 49<br>10.0% | 57<br>11.7% | 38<br>7.8% | 62<br>12.7% | 58<br>11.9% | 39<br>8.0% | 43<br>8.8% | 54<br>11.0% | 50<br>10.2% | 489<br>100.0% |







75

Too few individuals exited BQC classes prior to graduation to assess the impact of technical vs. nontechnical preparation on attrition or setback.

**INSTITUTIONAL VARIABLES.** The performance of NROTC graduates as measured by GPA and reading scores was tabulated for all categories of each institutional variable identified in section II of this report. Results of these tabulations are presented in table 28.

Differences in GPAs among institutions grouped by Barron's competitive criteria were not found to be significant. GPAs based on faculty salary categories roughly parallel these rank data (i.e., higher salary = higher mean GPA), and here also differences in mean GPA are not statistically significant.

Students from "multiversity" institutions achieved GPAs significantly higher than those achieved by technical or LAS emphasis schools ($F = 8.27$, $p > .01$). When grouped by the predominant ethnic composition of the student body, performances are indicated by a minority student GPA of 85.90 (S.D. = 5.69, N = 16) and a majority student GPA of 88.75 (S.D. = 4.45, N = 355). Similarly, graduates of coeducational institutions achieved a higher GPA (88.70, S.D. = 4.5, N = 368) than did all-male institutional graduates (81.97, S.D. = 3.76, N = 3). For both characteristics, however, the low number of cases in minority and all-male categories suggests that inferences using these data be made with caution. Students from private schools (GPA = 91.123, S.D. = 4.12, N = 48) did significantly better than those from either public (88.221, S.D. = 4.57, N = 276) or catholic schools (88.582, S.D. = 3.89, N = 47). Categories of institutional environment, size and geographical location had little impact on mean GPAs achieved.

Significant differences among reading scores as a function of college rank and ethnic composition were similar to those found among GPAs; however, no other institutional variable produced significant differences in reading scores among its categories. College GPAs, as reported by students, did not differ significantly among categories of any institutional characteristic. No attrition or setback data were available to permit assessment of institutional characteristics by these criteria.

TABLE 28. BQC PERFORMANCE BY INSTITUTIONAL CHARACTERISTICS

| INSTITUTION CHARACTERISTIC | CATEGORY | GPA MEAN | GPA S.D. | GPA N | READING SCORE MEAN | READING SCORE S.D. | READING SCORE N |
|---|---|---|---|---|---|---|---|
| Barron's Ranking | Highly Competitive | 89.97 | 4.42 | 45 | 15.27 | .39 | 22 |
| | Very Competitive | 89.30 | 4.34 | 90 | 15.12 | .64 | 34 |
| | Competitive | 88.24 | 4.44 | 190 | 14.55 | 1.02 | 88 |
| | Less Competitive | 86.85 | 5.54 | 22 | 13.11 | 1.70 | 11 |
| | Noncompetitive | 88.32 | 4.53 | 24 | 14.72 | .50 | 11 |
| Environment | Suburban | 88.20 | 4.39 | 179 | 14.64 | 1.81 | 83 |
| | Urban | 89.22 | 4.72 | 159 | 14.91 | .85 | 69 |
| | Rural | 88.11 | 4.22 | 33 | 13.75 | 1.89 | 14 |
| Type | University | 89.01 | 4.45 | 318 | 14.65 | 1.61 | 141 |
| | Technical | 86.35 | 5.39 | 19 | 14.73 | 1.01 | 10 |
| | LAS | 86.32 | 3.87 | 34 | 14.93 | .63 | 15 |
| Salary | High | 82.29 | 4.42 | 164 | 14.87 | 1.00 | 79 |
| | Average | 88.34 | 4.41 | 71 | 14.98 | .57 | 30 |
| | Low | 87.99 | 4.66 | 136 | 14.25 | .22 | 57 |
| Size | Less Than 5K | 87.51 | 4.95 | 69 | 14.44 | 1.35 | 34 |
| | Less Than 10K | 88.55 | 4.47 | 148 | 14.83 | 1.07 | 62 |
| | Less Than 15K | 89.12 | 4.43 | 48 | 14.97 | .54 | 20 |
| | Less Than 20K | 89.07 | 4.54 | 45 | 14.67 | 1.00 | 19 |
| | Greater Than 20K | 89.36 | 4.16 | 61 | 14.46 | 2.71 | 31 |
| Ethnic | Majority | 88.75 | 4.45 | 355 | 14.76 | 1.46 | 158 |
| | Minority | 85.90 | 5.69 | 16 | 13.00 | 1.79 | 8 |
| COED | Coed | 88.68 | 4.50 | 368 | 14.69 | 1.52 | 162 |
| | All Male | 81.97 | 3.76 | 3 | 14.05 | 1.31 | 4 |
| Geography | NE | 89.05 | 3.98 | 70 | 15.06 | .91 | 34 |
| | W | 88.86 | 3.98 | 83 | 14.37 | 1.41 | 41 |
| | MW | 89.27 | 4.26 | 84 | 14.85 | .65 | 35 |
| | SE | 87.86 | 5.19 | 134 | 14.56 | 2.13 | 56 |
| Control | Public | 88.19 | 4.57 | 276 | 14.50 | 1.69 | 126 |
| | Private | 91.18 | 4.12 | 48 | 15.31 | .41 | 21 |
| | Catholic | 88.58 | 3.89 | 47 | 15.16 | .47 | 19 |

# SECTION V

# NROTC GRADUATE PERFORMANCE AT SUBMARINE OFFICER BASIC COURSE

## SYNOPSIS

Two hundred ninety-six NROTC graduates assigned to the Submarine Officer Basic Course (SOBC) between 1978 and 1980 attained a mean GPA of 81.99 (100 point scale; passing score = 70). Although GPAs were well above the minimum passing score, there was a decline in performance during this period. Adjusted data show 49.6 of NROTC graduates scored in the top 50 percent of their class when compared to all other students.

Data on preparatory field of study were available for approximately half the total sample. Of these, only one-sixth were nontechnical majors. Nontechnical students did less well by GPA (79.72 to 81.16) and significantly less well in rank in class (26.1 percent vs. 54 percent in top half).

Attrition/setback data were insufficient for analysis as performance criteria; institutional variables had no effect on GPAs or class standing.

## INTRODUCTION

The Submarine Officer Basic Course is the initial, post accession, subsurface warfare training program undertaken by NROTC graduates selecting assignment to submarines. Approximately 12 weeks in length, the SOBC curriculum includes submarine-oriented topics such as control and weapons systems, sensors, communications, navigation, supply, and quality assurance. Completion of this course is a necessary prerequisite for qualification in submarines. All nuclear-trained officers assigned to submarines must complete the SOBC, but not all submarine-designated officers will complete nuclear power training. Graduates of other schools (e.g., Supply Corps) assigned to submarines will usually complete SOBC. When two courses are required for a specific assignment aboard submarines, the sequence of courses is optional and is usually governed by availability of seats in the pertinent courses.

The evaluation process for SOBC is relatively straightforward. Students are graded on the basis of academic/practical performance in specific subject areas. These grades are weighted (generally proportional to the amount of time spent on each topic) and averaged to obtain a cumulative performance indicator, or course GPA. A grade of 70 on a 100 point scale is passing.

For purposes of the current assessment, NROTC graduate performance was described by the final course GPA and by standing in class. Variables used as a basis for grouping and comparisons were those listed in section II of this report, modified as follows:

- no representatives of predominately minority institutions were found among those cases identified for analysis
- attrition/setback data were not obtained in numbers sufficient for use as measures of performance.

## PRESENTATION OF DATA

Data describing 300 SOBC cases were obtained. Not all cases contained data describing all variables; thus, the specific numbers of cases used in subsequent analyses may vary. All cases containing the necessary data elements were used in each analysis.

The average GPA computed was 81.99 (S.D. = 3.85, N = 296). Tables 29, 30, and 31 display GPAs, standard deviations, and variances by NROTC unit, major field of study, and class, respectively. The small number of cases for many of the groups render specific comparisons almost impossible. GPA performance trends as a function of sequential class GPA and annual mean GPA for the period 1978-1980 are shown in figure 11. Available data show that mean GPA slightly declined during this time.

Relative standing in class was also used to describe the performance of NROTC graduates in SOBC. Unfortunately, the Ns for cells resulting from grouping standings in class by class number are small; however, they offer an opportunity to examine relative distributions and identify potential trends in the data.

Figure 12 displays information on class standing as measured by decile rank. The matrix shows the number of cases falling into each cell; both numbers and percentages are used to describe column totals. Approximately 45.6 percent (N = 135) NROTC graduates ranked in the top half of their class when compared to all students in class. Data obtained for class 7807 show all 23 NROTC graduates ranked in the bottom 10 percent of their class. This information is not consistent with other data and may reflect errors in the manual data collection or data entry into the MIS. Accordingly, a second summary was developed excluding data from class 7807. Summary numbers and percentages for deciles without class 7807 are shown separately at the bottom of figure 12. In this second summary, approximately 49.6 percent of NROTC graduates ranked in the top half of their SOBC class.

**THE EFFECT ON PERFORMANCE OF TECHNICAL/NONTECHNICAL BACKGROUND.** Performance comparisons were made between NROTC graduates whose major field of study was in a technical area and those whose majors were nontechnical. For the roughly 50 percent of the original SOBC cases containing such data, graduates with technical backgrounds achieved a GPA = 81.16 (S.D. = 3.22, N = 115); graduates with nontechnical backgrounds earned a mean GPA of 79.72 (S.D. = 3.43, N = 23). The difference between these group means is not statistically significant. However, as shown in figure 13, 54 percent of technical graduates were in the top half of their respective classes, a figure double that achieved by nontechnical graduates.

**INSTITUTIONAL CHARACTERISTICS.** Table 32 summarizes the mean GPAs as a function of each category of the institutional characteristics identified in section II. None of the variables demonstrated significantly different mean GPAs among their respective categories. Similarly, frequency distributions of class standing were not significantly affected by any of the institutional characteristics identified in table 32.

TABLE 29. SOBC PERFORMANCE BY NROTC UNITS

| COLLEGE | MEAN | STD DEV | VARIANCE | N |
|---|---|---|---|---|
| AUBURN | 83.56 | 2.96 | 8.76 | 4 |
| U C BERKELEY | 81.15 | 2.87 | 8.23 | 5 |
| UCLA | 82.50 | 0.70 | 0.50 | 2 |
| CITADEL | 79.00 | 0.0 | 0.0 | 1 |
| U COLORADO | 84.55 | 3.48 | 12.13 | 5 |
| CORNELL | 81.91 | 2.70 | 7.28 | 8 |
| DUKE | 86.08 | 2.60 | 6.77 | 3 |
| U FLORIDA | 78.96 | 3.40 | 12.17 | 7 |
| GEORGIA TECH | 80.82 | 2.45 | 6.01 | 11 |
| HOLY CROSS | 79.50 | 4.04 | 16.33 | 4 |
| U IDAHO | 83.50 | 1.73 | 3.00 | 4 |
| IIT | 81.75 | 0.0 | 0.0 | 1 |
| U ILLINOIS | 83.50 | 0.71 | 0.50 | 2 |
| IOWA ST | 88.00 | 0.0 | 0.0 | 1 |
| JACKSONVILLE U | 84.12 | 3.0 | 9.03 | 2 |
| U KANSAS | 81.00 | 0.0 | 0.0 | 1 |
| MAINE MARITIME | 83.62 | 3.71 | 13.78 | 2 |
| MARQUETTE | 82.12 | 3.94 | 15.52 | 4 |
| MIT | 81.55 | 4.15 | 17.26 | 5 |
| MIAMI U OHIO | 76.00 | 0.0 | 0.0 | 1 |
| U MICHIGAN | 82.20 | 3.07 | 9.45 | 10 |
| U MINNESOTA | 82.83 | 4.25 | 18.08 | 3 |
| U MISSISSIPPI | 78.00 | 0.0 | 0.0 | 1 |
| U MISSOURI | 85.83 | 4.25 | 18.08 | 3 |
| U NEBRASKA | 85.06 | 3.63 | 13.18 | 4 |
| U NEW MEXICO | 83.33 | 3.71 | 13.76 | 6 |
| U N CAROLINA | 82.33 | 1.53 | 2.33 | 3 |
| NORTHWESTERN | 81.45 | 3.52 | 12.41 | 5 |
| NOTRE DAME | 83.50 | 0.0 | 0.0 | 1 |
| OHIO ST | 82.44 | 3.07 | 9.43 | 4 |
| U OKLAHOMA | 79.00 | 12.73 | 162.00 | 2 |
| OREGON ST | 82.41 | 2.65 | 7.04 | 6 |
| PENN ST | 81.98 | 3.67 | 13.45 | 14 |
| U PENNSYLVANIA | 81.08 | 3.56 | 12.64 | 3 |
| PURDUE | 84.65 | 2.92 | 8.55 | 5 |
| RPI | 83.61 | 2.49 | 6.20 | 11 |
| RICE | 86.25 | 5.17 | 26.75 | 6 |
| U ROCHESTER | 81.69 | 3.86 | 14.89 | 4 |
| U S CAROLINA | 81.45 | 3.78 | 14.26 | 5 |
| USC | 80.25 | 3.59 | 12.91 | 4 |
| TEXAS A&M | 82.25 | 2.85 | 8.12 | 5 |
| TULANE | 81.87 | 4.05 | 16.39 | 4 |
| UTAH | 82.50 | 1.06 | 1.12 | 2 |
| VANDERBILT | 84.00 | 4.60 | 21.20 | 4 |
| VILLANOVA | 79.44 | 2.93 | 8.59 | 4 |
| U VIRGINIA | 85.30 | 2.52 | 6.35 | 5 |
| U WASHINGTON | 79.17 | 3.02 | 9.14 | 6 |
| U WISCONSIN | 80.50 | 2.38 | 5.66 | 4 |
| SUNY MARITIME | 87.00 | 0.0 | 0.0 | 1 |
| VMI | 78.67 | 3.7 | 14.33 | 3 |
| Average | 82.32 | 3.65 | 13.35 | 211 |

TABLE 30. SOBC PERFORMANCE BY MAJOR FIELDS OF STUDY

| MAJOR | MEAN | STD DEV | VARIANCE | N |
|---|---|---|---|---|
| HUSBANDRY | 76.25 | 0.0 | 0.0 | 1 |
| BIOL SCI | 80.67 | 2.52 | 6.33 | 3 |
| MISC BIO | 83.00 | 0.0 | 0.0 | 1 |
| OPTOMETR | 78.00 | 0.0 | 0.0 | 1 |
| MISC MED | 82.00 | 5.6 | 32.00 | 2 |
| CHEMISTRY | 79.85 | 4.60 | 21.14 | 7 |
| CERAMICS | 78.00 | 0.0 | 0.0 | 1 |
| MATH | 82.89 | 3.15 | 9.89 | 11 |
| PHYSICS | 83.57 | 2.23 | 4.96 | 7 |
| CIV ENG | 79.75 | 2.99 | 8.92 | 4 |
| NAV ARCH | 84.33 | 3.51 | 12.33 | 3 |
| NUC ENG | 81.37 | 2.99 | 8.94 | 13 |
| INDS ENG | 78.67 | 1.58 | 2.33 | 3 |
| CHEM ENG | 80.58 | 3.96 | 15.72 | 12 |
| ELEC ENG | 80.87 | 3.10 | 9.66 | 23 |
| MECH ENG | 80.82 | 2.35 | 5.51 | 17 |
| AERO ENG | 84.00 | 0.0 | 0.0 | 1 |
| METL ENG | 80.50 | 2.12 | 4.50 | 2 |
| ENGINEER | 80.12 | 4.13 | 17.06 | 4 |
| INDS MGT | 80.00 | 0.0 | 0.0 | 1 |
| ECONOMICS | 78.00 | 0.0 | 0.0 | 1 |
| ACCOUNTG | 81.20 | 2.5 | 6.7 | 5 |
| BUS ADM | 77.42 | 3.0 | 9.0 | 6 |
| FINANCE | 81.75 | 0.0 | 0.0 | 1 |
| ENGLISH | 80.50 | 4.9 | 24.50 | 2 |
| MAJOR Not Elsewhere Classified | 81.00 | 4.24 | 18.00 | 6 |
| Average | 80.92 | 3.29 | 10.81 | 138 |

TABLE 31. SOBC PERFORMANCE BY CLASS

| CLASS | MEAN | STD DEV | VARIANCE | N |
|---|---|---|---|---|
| 8004 | 81.23 | 1.96 | 3.85 | 13 |
| 8003 | 79.25 | 1.83 | 3.35 | 8 |
| 8002 | 88.00 | 0.0 | 0.0 | 1 |
| 8001 | 79.85 | 4.53 | 20.55 | 20 |
| 7908 | 81.04 | 3.24 | 10.49 | 23 |
| 7907 | 80.46 | 3.62 | 13.08 | 61 |
| 7906 | 82.50 | 2.15 | 4.63 | 12 |
| 7905 | 81.33 | 4.16 | 17.33 | 3 |
| 7904 | 80.80 | 6.26 | 39.20 | 5 |
| 7903 | 80.70 | 3.37 | 11.34 | 10 |
| 7902 | 78.43 | 3.41 | 11.61 | 7 |
| 7901 | 82.12 | 2.84 | 8.07 | 19 |
| 7807 | 80.75 | 3.54 | 12.51 | 23 |
| 7806 | 84.77 | 3.33 | 11.08 | 34 |
| 7805 | 84.87 | 2.08 | 4.32 | 16 |
| 7804 | 84.50 | 0.71 | 0.50 | 2 |
| 7803 | 84.18 | 2.54 | 6.45 | 7 |
| 7802 | 84.42 | 3.62 | 13.11 | 23 |
| 7801 | 85.61 | 3.53 | 12.48 | 9 |
| Average | 81.99 | 3.85 | 14.83 | 296 |

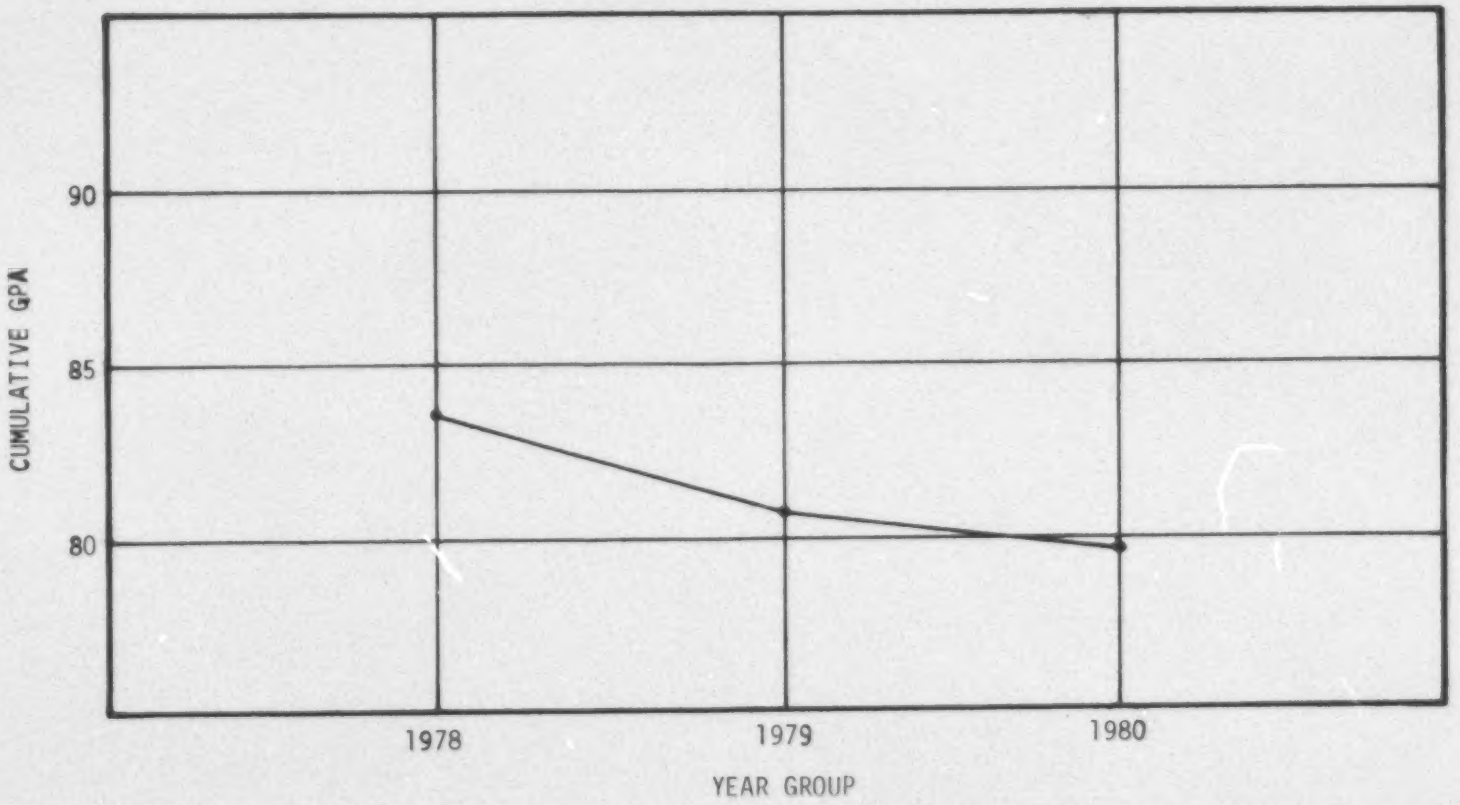


Figure 11. Performance Trend by Class Based on GPA

| Class No. | CLASS STANDING (DECILES) Top 10% | 2nd | 3rd | 4th | 5th | 6th | 7th | 8th | 9th | Bottom 10% | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 04 | | | 2 | 1 | 2 | 2 | 2 | 2 | 1 | 1 | 13 |
| 03 | | | | 1 | 1 | 3 | 1 | 1 | 1 | | 8 |
| 02 | | 1 | | | | | | | | | 1 |
| 8001 | 1 | 2 | | 1 | 1 | 2 | 3 | 3 | 5 | 2 | 20 |
| 08 | 2 | 1 | 3 | 5 | 2 | 2 | 4 | 3 | 1 | | 23 |
| 07 | 7 | 5 | 7 | 7 | 7 | 4 | 7 | 7 | 7 | 3 | 61 |
| 06 | 1 | 2 | 2 | 3 | 1 | 2 | | | 1 | | 12 |
| 05 | | 1 | | | | | 1 | 1 | | | 3 |
| 04 | | 2 | 1 | | | 1 | | | | 1 | 5 |
| 03 | 1 | | 1 | 1 | 2 | 2 | | | | 3 | 10 |
| 02 | | | | | | 1 | | 2 | 2 | 2 | 7 |
| 7901 | 1 | 2 | 1 | 2 | 2 | 3 | 1 | 2 | 4 | 1 | 19 |
| 07 | | | | | | | | | | 23 | 23 |
| 06 | 5 | 4 | 1 | 6 | 2 | 3 | 1 | 5 | 2 | 5 | 34 |
| 05 | | 1 | 1 | 3 | 1 | 2 | 2 | 3 | | 3 | 16 |
| 04 | | | 1 | | 1 | | | | | | 2 |
| 03 | | 1 | | 1 | 1 | 1 | | 1 | 1 | 1 | 7 |
| 02 | 7 | | 2 | 3 | 2 | 4 | 1 | 1 | 1 | 2 | 23 |
| 7801 | 3 | 1 | 3 | | | 1 | | | | 1 | 9 |
| Total number | 28 | 23 | 25 | 34 | 25 | 33 | 23 | 31 | 26 | 48 | 296 |
| Percent | 9.5 | 7.8 | 8.4 | 11.5 | 8.4 | 11.1 | 7.8 | 10.5 | 8.8 | 16.2 | |
| | 10.3 | 8.4 | 9.2 | 12.5 | 9.2 | 12.1 | 8.4 | 11.4 | 9.5 | 9.2 | 273* |

* Percent excludes class 7807.

Figure 12. Matrix of Number of Students in Each Decile of Class Standing by Class Year

CLASS STANDING IN DECILES

| | Top 10% | 2nd | 3rd | 4th | 5th | 6th | 7th | 8th | 9th | Bottom 10% |
|---|---|---|---|---|---|---|---|---|---|---|
| Background | | | | | | | | | | |
| Technical (N = 115) | 11<br>9.6 | 10<br>8.7 | 14<br>12.2 | 16<br>13.9 | 11<br>9.6 | 11<br>9.6 | 12<br>10.4 | 16<br>13.9 | 9<br>7.8 | 5<br>4.3 |
| Nontechnical (N = 23) | 1<br>4.3 | 1<br>4.3 | 0 | 2<br>8.7 | 2<br>8.7 | 2<br>8.7 | 3<br>13.0 | 3<br>13.0 | 5<br>21.7 | 4<br>17.4 |
| Totals (N = 138) | 12<br>8.7 | 11<br>8.0 | 14<br>10.1 | 18<br>13.0 | 13<br>9.4 | 13<br>9.4 | 15<br>10.9 | 19<br>13.8 | 14<br>10.1 | 9<br>6.5 |

Figure 13. Cross Tabulation of Class Standing by Technical/Nontechnical Background

TABLE 32. SOBC PERFORMANCE BY INSTITUTIONAL CHARACTERISTICS

| INSTITUTIONAL CHARACTERISTICS | CATEGORY | MEAN GPA | S.D. | N | REMARKS |
|---|---|---|---|---|---|
| Rank | Most Competitive | 81.55 | 4.15 | 5 | |
| | Highly " | 83.60 | 3.54 | 41 | |
| | Very " | 81.56 | 3.19 | 62 | N.S.* |
| | Competitive | 82.12 | 3.90 | 90 | |
| | Less Competitive | 83.33 | 3.71 | 6 | |
| | Noncompetitive | 83.44 | 3.32 | 9 | |
| Environment | | | | | |
| | Suburban | 82.19 | 4.17 | 87 | |
| | Urban | 82.40 | 3.28 | 106 | N.S. |
| | Rural | 82.45 | 3.31 | 20 | |
| Type | | | | | |
| | University | 82.44 | 3.73 | 172 | |
| | Tech | 82.01 | 3.22 | 34 | N.S. |
| | LAS | 80.75 | 3.88 | 7 | |
| Salary | | | | | |
| | High | 82.45 | 3.75 | 106 | |
| | Average | 82.10 | 3.32 | 31 | N.S. |
| | Low | 82.23 | 3.69 | 76 | |
| Size | | | | | |
| | Less than 5K | 82.92 | 4.15 | 38 | |
| | Less than 10K | 82.22 | 3.36 | 73 | |
| | Less than 15K | 81.79 | 3.24 | 29 | N.S. |
| | Less than 20K | 82.98 | 4.17 | 33 | |
| | Greater than 20K | 81.76 | 3.51 | 40 | |
| Coed Status | | | | | |
| | Coed | 82.34 | 3.64 | 206 | |
| | All Male | 81.71 | 4.19 | 7 | N.S. |
| Geography Location | | | | | |
| | NE | 81.97 | 3.38 | 56 | |
| | W | 82.41 | 3.99 | 58 | N.S. |
| | MW | 82.98 | 3.42 | 45 | |
| | SE | 82.03 | 3.76 | 54 | |
| Control | | | | | |
| | Public | 82.33 | 3.57 | 154 | |
| | Private | 82.76 | 3.89 | 46 | N.S. |
| | Catholic | 80.60 | 3.53 | 13 | |
| Technical Background | Technical | 81.16 | 3.22 | 115 | N.S. |
| | Nontechnical | 79.72 | 3.43 | 23 | |

*N.S. = not significant.

## SECTION VI

## NROTC GRADUATE PERFORMANCE AT NUCLEAR POWER SCHOOL

### SYNOPSIS

Data obtained to describe NROTC graduate performance at the academic portion of Nuclear Power School post-accession training show a remarkably homogeneous student body. The mean cumulative GPA achieved was 3.22 (S.D. = .25, N = 504) for students during classes between 1976 and 1980; annual GPAs varied from this mean by only .02. 49.1 percent of NROTC graduates stood in the top half of all class graduates; attrition was 8.5 percent.

Although technically prepared students (cumulative GPA = 3.22, N = 287) generally did slightly better than students with a nontechnical background (cumulative GPA = 3.16, N = 15), differences were usually not significant. However, only a few cases existed to represent students without technical preparation. Nontechnically prepared students suffered twice as many attritions.

Although several significant differences existed between selected categories of institutional variables, on the whole, few differences of practical significance were found. Data sufficient to describe performances of representatives of predominately minority schools were not acquired.

### INTRODUCTION

An officer's qualification for assignment to billets involving nuclear power is predicated upon successful completion of a thorough and rigorous post-accession training program. The training is provided in separate, but related, parts: (1) approximately 24 weeks of academic instruction is completed at the Nuclear Power School, Orlando, Florida, to provide background and to establish a common level of knowledge about nuclear power principles and practices and (2) approximately the same amount of time is used for application and practice of that knowledge on an operational prototype at one of several nuclear reactor sites. For the present study, performance was assessed only in terms of the academic instruction part of nuclear power training.

The course of academic instruction in nuclear power is essentially the same for prospective officers for both nuclear submarines and nuclear surface ships. Course content is built around the following basic subject areas:

- Mathematics (MATH)--topics from algebra, trigonometry, logarithms, analytical geometry, and calculus develop logic and analytical skill and support specific areas of the Nuclear Power School curriculum

- Physics (PHYS)--principles of mechanics, electrostatics, electrodynamics, and techniques of solving problems in classical and nuclear-related physics

- Heat Transfer and Fluid Flow (HTFF)--energy transfer, fluid flow conversions, application of thermodynamics and hydraulics necessary to understand design criteria, operating procedures and limitations of a reactor plant

- Electrical Engineering (EE)--basic electrical theory as it relates to power distribution systems and electronics to support understanding of instrumentation

- Chemistry, Materials, and Radiological Fundamentals (CMRF)--principles of general chemistry necessary to understand corrosion and corrosion control associated with a naval reactor plant; familiarization with materials used in naval nuclear reactor plant operations; the properties of radiation, its potential hazards, the rules for behavior in radiation areas; equipment and methods for measuring radiation

- Reactor Dynamics/Core Characteristics (RD/CC)--fundamentals of reactor kinetics, dynamic reactor behavior and control, and integrated reactor plant behavior in the subpower range; application of basic principles learned in Reactor Dynamics, Materials, and Aspects of Reactor Plant Operations to core design

- Aspect of Reactor Plant Operations (ARPO)--application of fundamental principles to operational situations; safety considerations in operations.

By and large, nuclear power training for officers is voluntary and no undergraduate major field of study has been established as a prerequisite for entry. These conditions might normally be expected to lead to a fairly broad spectrum of performance levels in various backgrounds; in fact, the opposite is true. Nearly all entrants to nuclear power training have completed undergraduate study in a technical field (e.g., engineering, math). More important, however, the selection procedures used to choose among volunteers have resulted in a cadre of uniformly qualified officers. NROTC program graduates selected for nuclear power training have undergone the same screening process as all other entrants; thus, although they may represent diverse kinds of undergraduate institutions, their preparation and performance levels tend toward a uniform quality.

Assessment of NROTC graduate performance at Nuclear Power School is based on grade point averages obtained for each of the primary content areas just identified. In addition, student scores achieved on a comprehensive examination (COMP), administered at the completion of academic training, are used as a measure of performance. A cumulative GPA based on all of these components has been computed and is used as the primary basis for comparison.

Other variables, both descriptive and criterion, include those identified in section II, with the following modifications:

- no data representative of predominately minority institutions are included in the sample

. setback data were not available.

## PRESENTATION OF DATA

A total of 544 cases provided data for review. These data show a mean GPA for NROTC graduates at Nuclear Power School of 3.22 (S.D. = .25, N = 504). Tables 33, 34, and 35 provide breakdowns of this performance by NROTC unit and major field of undergraduate study. For NROTC units, average GPAs ranged from 2.88 (S.D. = .16, N = 3) to 3.46 (S.D. = .23, N = 8), but Ns were small for a number of schools. The range of GPAs for major fields of study (with N = 10) extended between 3.30 (S.D. = .22, N = 39) and 3.12 (S.D. = .21, N = 11). Viewed by class year, GPAs remain remarkably stable. Table 35 and figure 14 display GPAs as a function of sequential class and class year.

NROTC graduate standings in class were converted to deciles and used as a second measure of performance. Profiles based on standing were computed for each NROTC unit, major, and class. A composite profile of 497 cases is shown in table 36. Slightly less than 50 percent of NROTC students were in the top half of their classes when compared to all students in those classes.

Attrition data obtained during the project show an NROTC graduate attrition rate of 8.5 percent (N = 544; 46 attrites). Attrition data were developed for NROTC graduates grouped by NROTC unit, major field of study, and class. Because of the low number of cases for most unit and major subgroups, these data are not included here. Attrition by class year is given in table 37. No setback data were available.

**PERFORMANCE BASED ON TECHNICAL/NONTECHNICAL BACKGROUND.** The vast majority of Nuclear Power School entrants arrive with a background in a technical area of study (e.g., engineering, science, math, physics). Although the Nuclear Power course is "technical" in its emphasis, no requirement exists for such a background; thus, a small percentage of entering students have majored in business, the social sciences, or liberal arts. The performances of technical and nontechnical groups were compared using the same criteria that had been applied to the total sample. Caution should be exercised in interpreting the results of these comparisons because of the relatively small Ns available to describe the nontechnical NROTC graduate.

Tables 38, 39, and 40 compare the performance of NROTC graduates grouped by technical-nontechnical background. Although graduates with technical backgrounds achieved slightly higher GPAs in most academic areas for which data were available, the cumulative difference between these two groups was not statistically significant. Among specific academic areas, math (MATH) and heat transfer/fluid flow (HTFF) units showed the greatest differences between scores of these two groups.

TABLE 33. NUCLEAR POWER SCHOOL PERFORMANCE BY NROTC UNIT

| COLLEGE | MEAN | STD DEV | VARIANCE | N |
|---|---|---|---|---|
| AUBURN | 3.24 | 0.21 | 0.04 | 12 |
| UC BERKELEY | 3.25 | 0.34 | 0.12 | 7 |
| UCLA | 3.33 | 0.25 | 0.06 | 4 |
| CITADEL | 3.04 | 0.31 | 0.10 | 4 |
| U COLORADO | 3.35 | 0.24 | 0.06 | 10 |
| CORNELL | 3.27 | 0.21 | 0.05 | 15 |
| DUKE | 3.41 | 0.13 | 0.02 | 8 |
| U FLORIDA | 3.19 | 0.22 | 0.05 | 15 |
| GEORGIA TECH | 3.15 | 0.25 | 0.06 | 37 |
| HOLY CROSS | 3.17 | 0.24 | 0.06 | 8 |
| U IDAHO | 3.33 | 0.19 | 0.04 | 7 |
| IIT | 3.20 | 0.25 | 0.06 | 13 |
| U ILLINOIS | 3.28 | 0.23 | 0.05 | 9 |
| IOWA ST | 3.22 | 0.24 | 0.06 | 7 |
| JACKSONVILLE U | 2.88 | 0.16 | 0.03 | 3 |
| U KANSAS | 3.15 | 0.34 | 0.12 | 5 |
| MAINE MARITIME | 2.91 | 0.07 | 0.01 | 2 |
| MARQUETTE | 3.31 | 0.15 | 0.02 | 4 |
| MIT | 3.25 | 0.28 | 0.08 | 13 |
| MIAMI U OHIO | 3.05 | 0.13 | 0.02 | 5 |
| U MICHIGAN | 3.19 | 0.22 | 0.05 | 24 |
| U MINNESOTA | 3.32 | 0.18 | 0.03 | 4 |
| U MISSISSIPPI | 3.02 | 0.01 | 0.00 | 2 |
| U MISSOURI | 3.26 | 0.26 | 0.07 | 9 |
| U NEBRASKA | 3.35 | 0.27 | 0.07 | 5 |
| U NEW MEXICO | 3.18 | 0.21 | 0.04 | 9 |
| U N CAROLINA | 3.27 | 0.29 | 0.08 | 6 |
| NORTHWESTERN | 3.11 | 0.30 | 0.09 | 11 |
| NOTRE DAME | 3.16 | 0.33 | 0.11 | 12 |
| OHIO ST | 3.21 | 0.24 | 0.06 | 10 |
| U OKLAHOMA | 3.21 | 0.14 | 0.02 | 5 |
| OREGON ST | 3.24 | 0.25 | 0.06 | 20 |
| PENN ST | 3.35 | 0.18 | 0.03 | 21 |
| U PENNSYLVANIA | 3.07 | 0.31 | 0.09 | 9 |
| PURDUE | 3.38 | 0.30 | 0.09 | 6 |
| RPI | 3.34 | 0.23 | 0.05 | 22 |
| RICE | 3.46 | 0.23 | 0.05 | 8 |
| U ROCHESTER | 3.28 | 0.29 | 0.09 | 7 |
| U SO CAROLINA | 3.22 | 0.20 | 0.04 | 5 |
| USC | 3.03 | 0.21 | 0.04 | 9 |
| TEXAS A&M | 3.31 | 0.13 | 0.02 | 12 |
| TEXAS | 3.19 | 0.28 | 0.08 | 8 |
| TULANE | 3.14 | 0.29 | 0.09 | 9 |
| U UTAH | 3.29 | 0.28 | 0.08 | 7 |
| VANDERBILT | 3.14 | 0.25 | 0.06 | 14 |
| VILLANOVA | 3.02 | 0.22 | 0.05 | 10 |
| U VIRGINIA | 3.18 | 0.26 | 0.07 | 14 |
| U WASHINGTON | 3.22 | 0.20 | 0.04 | 12 |
| U WISCONSIN | 3.15 | 0.31 | 0.09 | 7 |
| SUNY MARITIME | 3.04 | 0.0 | 0.0 | 1 |
| VMI | 3.08 | 0.29 | 0.08 | 11 |
| AVERAGE | 3.22 | 0.25 | 0.06 | 504 |

TABLE 34. NUCLEAR POWER SCHOOL PERFORMANCE BY MAJOR FIELD OF UNDERGRADUATE STUDY

| MAJOR | MEAN | STD DEV | VARIANCE | N |
|---|---|---|---|---|
| BIOL SCI | 3.35 | 0.20 | 0.04 | 2 |
| BACTERIO | 3.06 | 0.0 | 0.0 | 1 |
| MISC BIO | 3.04 | 0.38 | 0.14 | 4 |
| OPTOMETR | 3.59 | 0.0 | 0.0 | 1 |
| MISC MED | 3.38 | 0.28 | 0.08 | 3 |
| GEOLOGY | 3.26 | 0.15 | 0.02 | 2 |
| OPS RSCH | 3.13 | 0.06 | 0.00 | 2 |
| METEORL | 3.23 | 0.55 | 0.30 | 2 |
| CHEMISTRY | 3.12 | 0.21 | 0.04 | 11 |
| CERAMICS | 3.32 | 0.04 | 0.00 | 2 |
| MATH | 3.20 | 0.27 | 0.07 | 20 |
| PHYSICS | 3.25 | 0.27 | 0.07 | 22 |
| CIV ENG | 3.17 | 0.28 | 0.08 | 11 |
| NAV ARCH | 3.19 | 0.22 | 0.05 | 4 |
| NUC ENG | 3.30 | 0.22 | 0.05 | 39 |
| INDS ENG | 3.08 | 0.26 | 0.07 | 4 |
| CHEM ENG | 3.27 | 0.24 | 0.06 | 26 |
| ELEC ENG | 3.24 | 0.26 | 0.07 | 54 |
| MECH ENG | 3.17 | 0.22 | 0.05 | 47 |
| AERO ENG | 3.14 | 0.31 | 0.10 | 5 |
| METL ENG | 3.08 | 0.24 | 0.06 | 3 |
| ENGINEER | 3.07 | 0.29 | 0.08 | 7 |
| POLY SCI | 2.76 | 0.0 | 0.0 | 2 |
| ENGLISH | 3.21 | 0.21 | 0.04 | 2 |
| MAJOR Not Elsewhere Classified | 3.22 | 0.34 | 0.12 | 11 |
| Average | 3.21 | 0.25 | 0.06 | 287 |

TABLE 35. NUCLEAR POWER SCHOOL PERFORMANCE BY CLASS

| CLASS | MEAN | STD DEV | VARIANCE | N |
|---|---|---|---|---|
| 8003 | 3.26 | 0.26 | 0.07 | 14 |
| 8002 | 3.01 | 0.22 | 0.05 | 2 |
| 8001 | 2.91 | 0.0 | 0.0 | 1 |
| 7908 | 3.16 | 0.19 | 0.04 | 29 |
| 7907 | 3.21 | 0.25 | 0.06 | 46 |
| 7906 | 3.27 | 0.28 | 0.08 | 48 |
| 7905 | 3.37 | 0.11 | 0.01 | 3 |
| 7904 | 3.12 | 0.21 | 0.04 | 12 |
| 7903 | 3.19 | 0.20 | 0.04 | 10 |
| 7901 | 3.21 | 0.27 | 0.07 | 15 |
| 7807 | 3.24 | 0.30 | 0.09 | 19 |
| 7806 | 3.24 | 0.26 | 0.07 | 71 |
| 7805 | 3.14 | 0.25 | 0.06 | 14 |
| 7803 | 3.19 | 0.08 | 0.01 | 3 |
| 7802 | 3.38 | 0.09 | 0.01 | 6 |
| 7801 | 3.14 | 0.02 | 0.00 | 2 |
| 7709 | 3.19 | 0.26 | 0.07 | 21 |
| 7708 | 3.20 | 0.28 | 0.08 | 31 |
| 7707 | 3.21 | 0.27 | 0.07 | 42 |
| 7706 | 3.10 | 0.37 | 0.13 | 5 |
| 7705 | 3.18 | 0.0 | 0.0 | 1 |
| 7704 | 3.32 | 0.12 | 0.01 | 7 |
| 7703 | 3.30 | 0.07 | 0.00 | 5 |
| 7702 | 3.11 | 0.29 | 0.08 | 12 |
| 7701 | 3.24 | 0.27 | 0.08 | 29 |
| 7608 | 3.23 | 0.23 | 0.05 | 39 |
| 7607 | 3.11 | 0.34 | 0.11 | 3 |
| 7606 | 3.14 | 0.37 | 0.13 | 3 |
| 7605 | 3.25 | 0.22 | 0.05 | 7 |
| 7604 | 3.11 | 0.22 | 0.05 | 5 |
| Average | 3.21 | 0.29 | 0.08 | 505 |

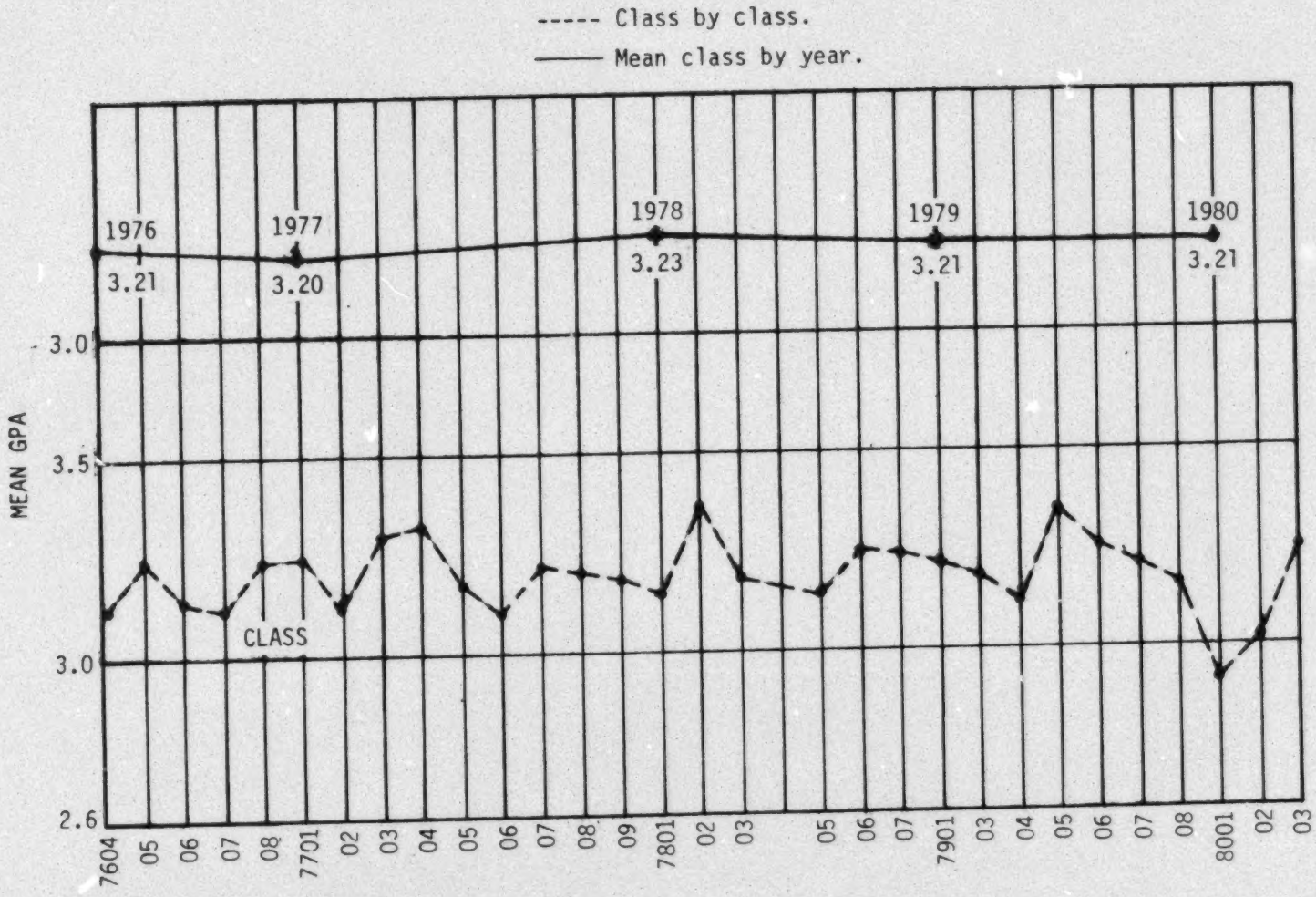


Figure 14. Performance Trend by Class/Year As Indicated by Mean GPA

TABLE 36. NROTC GRADUATE PROFILE BASED ON STANDING IN CLASS

| | CLASS STANDING | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | TOP 10% | 2nd | 3rd | 4th | 5th | 6th | 7th | 8th | 9th | BOTTOM 10% |
| N | 46 | 45 | 49 | 54 | 49 | 51 | 52 | 45 | 44 | 62 |
| % | 9.3 | 9.1 | 9.9 | 10.9 | 9.9 | 10.3 | 10.5 | 9.1 | 8.9 | 12.5 |

TABLE 37. NROTC GRADUATE ATTRITION FROM NUCLEAR POWER SCHOOL BY CLASS YEAR

| | 1976 | 1977 | 1978 | 1979 | 1980 | TOTAL |
|---|---|---|---|---|---|---|
| No. Attrites | 3 | 13 | 14 | 14 | 2 | 46 |
| % | 5.0 | 7.9 | 11.1 | 8.0 | 11.1 | 8.46 |
| N | 60 | 164 | 126 | 176 | 18 | 544 |

TABLE 38. GPA COMPARISONS FOR TECHNICAL/NONTECHNICAL BACKGROUND

| CONTENT AREA | BACKGROUND | |
|---|---|---|
| | TECHNICAL (N) | NONTECHNICAL (N) |
| MATH | 3.14 (303) | 2.83 (20) |
| PHYS | 3.29 (287) | 3.08 (17) |
| HTFF | 3.13 (299) | 2.88 (20) |
| EE | 3.18 (279) | 3.09 (16) |
| CMRF | 3.23 (274) | 3.11 (15) |
| RD/CC | 3.25 (275) | 3.24 (15) |
| ARPO | 3.19 (273) | 3.21 (15) |
| COMP | 3.12 (272) | 3.12 (15) |
| CUMULATIVE GPA | 3.22 (272) | 3.16 (15) |

TABLE 39. CROSS TABULATION OF TECHNICAL/NONTECHNICAL BACKGROUND BY STANDING IN CLASS AT NUCLEAR POWER SCHOOL

| BACKGROUND | CLASS STANDING | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | TOP 10% | 2nd | 3rd | 4th | 5th | 6th | 7th | 8th | 9th | BOTTOM 10% | TOTALS |
| TECHNICAL | | | | | | | | | | | |
| N | 20 | 26 | 24 | 31 | 23 | 29 | 28 | 25 | 24 | 34 | 264 |
| (%) | (7.6) | (9.8) | (9.1) | (11.7) | (8.7) | (11.0) | (10.6) | (9.5) | (9.1) | (12.9) | (94.6) |
| NONTECHNICAL | | | | | | | | | | | |
| N | 1 | 2 | 2 | 1 | 1 | 2 | 1 | 0 | 2 | 3 | 15 |
| (%) | (6.7) | (13.3) | (13.3) | (6.7) | (6.7) | (13.3) | (6.7) | (0) | (13.3) | (20.0) | (5.4) |
| TOTAL | | | | | | | | | | | |
| N | 21 | 28 | 26 | 32 | 24 | 31 | 29 | 25 | 26 | 37 | 279 |
| (%) | (7.5) | (10.0) | (9.3) | (11.5) | (8.6) | (11.1) | (10.4) | (9.0) | (9.30) | (13.3) | (100) |

TABLE 40. ATTRITION AS A FUNCTION OF TECHNICAL BACKGROUND

| | GRADUATE | ATTRITE | TOTAL |
|---|---|---|---|
| TECHNICAL N | 264 | 41 | 305 |
| % | (86.6) | (13.4) | |
| NONTECHNICAL N | 15 | 5 | 20 |
| (%) | (75.0) | (25.0) | |
| TOTAL | 279 | 46 | 325 |
| | (85.8) | (14.2) | |

A comparison of technical preparation by standing in class supports the GPA findings. Although decile comparisons produced varied results, 46.9 percent of technical (N = 264) and 46.7 percent of nontechnical (N = 15) graduates ranked in the top half of their respective classes when compared to all students. In terms of attrition data available for technical/nontechnical graduates, students who majored in nontechnical areas were about twice as likely to attrite as those with technical majors. The percentages of class standing and attrition in these tables are different from previous information due to the reduced number of cases for which data describing major field of study were available.

**INSTITUTIONAL CHARACTERISTICS.** GPA and attrite data were also examined as a function of institutional characteristics. The results of that compilation are presented in table 41. All variables were present in these data except no data were available on minority institutions. Measured against the criterion of cumulative GPA, no significant difference existed among the various categories of any of the institutional variables. Using attrition as a criterion, schools classified predominately as Liberal Arts institutions, small in size and/or Catholic showed significantly higher attrition rates than did the other categories describing each of those characteristics.

GPAs were also used as yardsticks for comparing the various categories of each institutional variable. Of the 64 comparisons computed (8 institutional variables, 8 academic subject/comprehensive exam GPAs), five were significant: students representing the LAS category of institutional type scored significantly lower in both MATH and HTFF subject areas; institutions whose student body is predominately male achieved significantly lower GPAs in math and physics; and data grouped by type of institutional control show representatives of Catholic institutions did less well in HTFF.

TABLE 41. NUCLEAR POWER SCHOOL PERFORMANCE WHEN GROUPED BY INSTITUTIONAL CHARACTERISTICS

| INSTITUTIONAL CHARACTERISTIC | CATEGORY | PERFORMANCE CRITERIA | | | |
|---|---|---|---|---|---|
| | | MEAN GPA | SD | N | % ATTRITES |
| INSTITUTION RANK | MOST COMPETITIVE | 3.25 | .28 | 13 | 7.1 |
| | HIGHLY COMPETITIVE | 3.26 | .27 | 87 | 7.5 |
| | VERY COMPETITIVE | 3.18 | .25 | 174 | 7.7 |
| | COMPETITIVE | 3.22 | .24 | 201 | 8.7 |
| | LESS COMPETITIVE | 3.18 | .21 | 9 | 18.2 |
| | NONCOMPETITIVE | 3.23 | .27 | 20 | 13.6 |
| ENVIRONMENT | SUBURBAN | 3.21 | .25 | 230 | 8.5 |
| | URBAN | 3.21 | .26 | 244 | 8.7 |
| | RURAL | 3.31 | .20 | 30 | 6.3 |
| TYPE | UNIVERSITY | 3.22 | .25 | 390 | 6.1 |
| | TECHNICAL | 3.20 | .27 | 99 | 14.3 |
| | LAS | 3.08 | .26 | 15 | 26.3 |
| SALARY | HIGH | 3.22 | .26 | 229 | 8.1 |
| | AVERAGE | 3.20 | .26 | 99 | 11.0 |
| | LOW | 3.22 | .24 | 176 | 7.5 |
| SIZE | LESS THAN 5K | 3.22 | .28 | 97 | 16.7 |
| | LESS THAN 10K | 3.20 | .26 | 170 | 7.8 |
| | LESS THAN 15K | 3.19 | .25 | 80 | 6.0 |
| | LESS THAN 20K | 3.25 | .23 | 71 | 5.4 |
| | GREATER THAN 20K | 3.24 | .24 | 86 | 4.4 |
| COEDUCATION STATUS | COED | 3.22 | .25 | 477 | 7.3 |
| | MALE | 3.12 | .26 | 27 | 25.7 |
| GEOGRAPHY | NE | 3.24 | .26 | 108 | 12.3 |
| | W | 3.25 | .24 | 127 | 5.2 |
| | MW | 3.21 | .25 | 124 | 9.2 |
| | SE | 3.17 | .25 | 145 | 7.7 |
| CONTROL | PUBLIC | 3.22 | .24 | 368 | 7.4 |
| | PRIVATE | 3.21 | .28 | 102 | 7.3 |
| | CATHOLIC | 3.14 | .27 | 34 | 22.0 |
| | MEAN | 3.22 | .253 | 504 | |

## SECTION VII

## NROTC GRADUATE PERFORMANCE IN AVIATION TRAINING

### SYNOPSIS

Data were available to describe the performance of pilots only in Aviation Preflight Indoctrination (API) and Primary Flight training portions of the aviation follow-on training pipeline. As in other post-accession programs, NROTC graduates scored at or near the average of all students. The mean of Navy Standard Scores (NSS) in API was 51.6 (S.D. = 7.52; N = 2,174); in Primary Flight the mean NSS was 51.23 (S.D. = 7.37; N = 1,380). The 3-year trend 1977-1979 for API based on these data was slightly up; the trend for Primary Flight was slightly down.

Students from technical backgrounds (majors) did better in both API and Primary Flight than did students with less technical preparation. In API, technical student NSS average for API was 54.69 (N = 649) while the nontechnical student NSS was 50.79 (N = 779); in Primary Flight the NSS scores were 63.2 (N = 387) to 50.12 (N = 424). Additional comparisons of entry test and math/physics exemption test scores between these two groups showed some differences in specific categories; however, the small number of cases involved for many categories make such differences suspect. Using attrition as an indicator of performance, students with nontechnical backgrounds attrited at a significantly greater rate than did students with technical preparation.

When scores achieved by NROTC unit representatives were compared on the basis of institutional characteristics, the variables Rank, Type, and Ethnic Predominance produced significant differences in API score, physics and math exemption scores, and attrition. For categories of Rank, the more competitive the institution, the higher the score; for Type, institutions emphasizing LAS scored lowest. Between schools where student bodies were of predominately majority or minority ethnic groups, the latter did less well; however, the low number of cases included in the minority group suggests these results should be interpreted with caution.

### INTRODUCTION

An NROTC graduate selected for aviation training may, upon commissioning, follow one of a number of different training "pipelines" in completing qualifications for that warfare specialty. Depending on the specific designator being acquired (e.g., Pilot, Naval Flight Officer (NFO)) students may be required to complete a series of preparatory experiences consisting of both "hands-on" and academic "classroom" training. Figure 15 displays the general structure of aviation training pipelines; each step after aviation preflight can be further differentiated on the basis of different airplane types, specific mission, and/or equipment configurations.

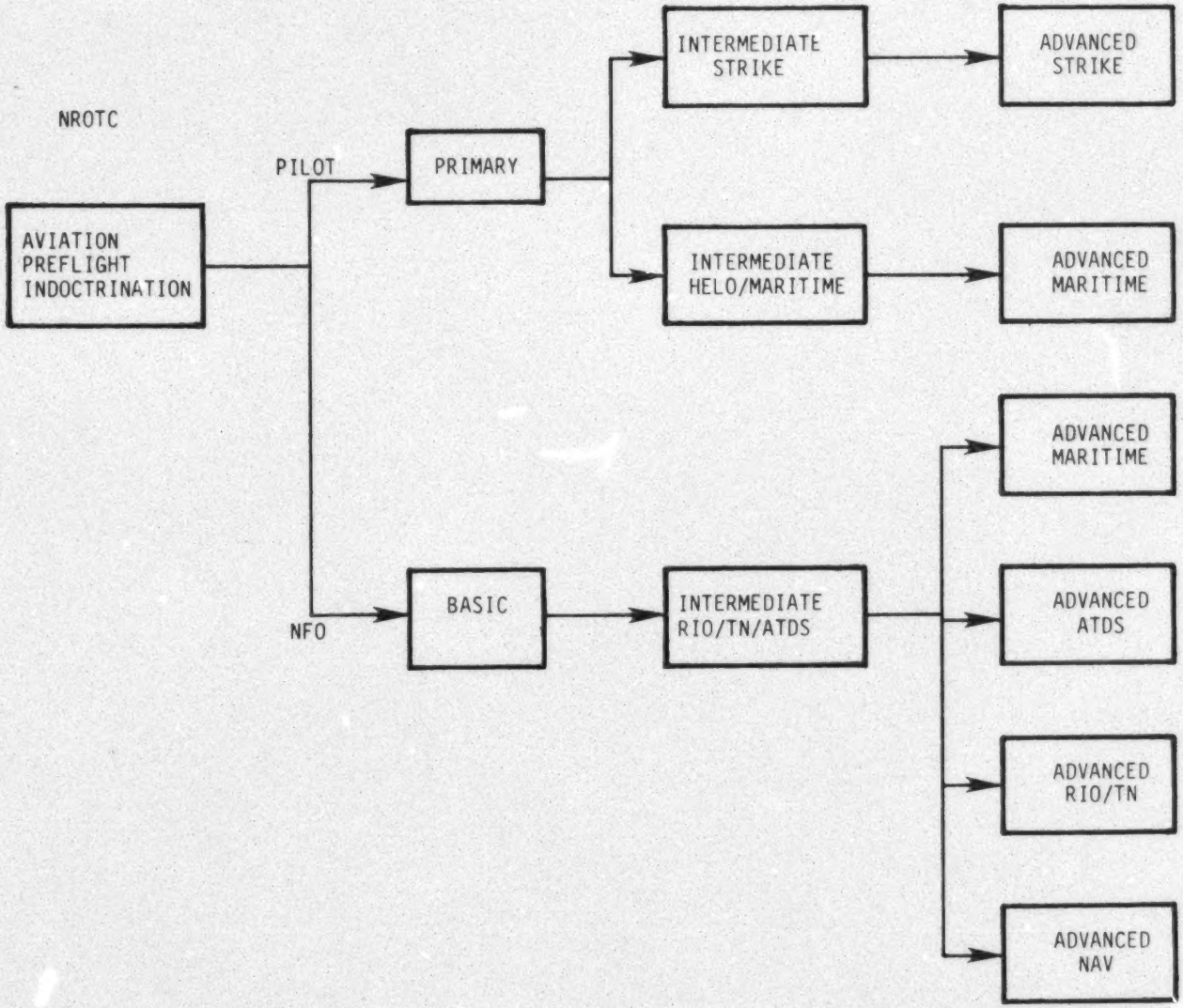


Figure 15. Simplified Diagram of Pilot/Naval Flight Officer Training Pipelines

The complexity and specific nature of post-accession, aviation training pipelines severely restricts the applicability of generalized performance measures for NROTC graduates. Therefore, the primary focus of this study was performance during Aviation Preflight Indoctrination (API), a part of the pipeline which all NROTC graduates must undergo.

API consists of approximately 6 weeks of classroom and physical training conducted at the Naval Aviation Schools Command, Pensacola, Florida. Primary subject areas include basic air navigation, basic aerodynamics, and basic aircraft engines; sea and land survival is also taught. All potential aviation-oriented designators must complete API.

Evaluations conducted during this period of training are of two types: (1) graded exercises in three primary subject areas are averaged to obtain a mean "academic" indicator and (2) "pass-fail" criteria are used to demonstrate satisfactory completion of sea and land survival training segments. This latter assessment is separate from subject area grades. Designator-specific command equivalency tables are then applied to pilot and NFO API grades to develop a standard score.

Although both pilots and NFOs undergo essentially the same preflight indoctrination, the data reported here are only for pilots. Although no data on NFO training were available for the present study, it is anticipated that future NFO data will be included in the data base when they are acquired.

Data for pilots reflect training conducted at two separate locations, each emphasizing preparation using a different aircraft. Performance data describing NROTC graduates assigned to pilot training pipelines were acquired from the Human Factors Data Bank maintained by the Naval Aerospace Medical Research Laboratory in Pensacola, Florida. Specific pilot performance measures used included:

- a mean grade point average (GPA) for API
- a mean GPA for primary (pilot) training, with the recognition that although these marks are based on similar syllabi, inferences based on them must be carefully drawn because of the use of different training platforms
- individual scores on mechanical comprehension tests, spatial apperception tests, aviation qualification tests, and math/physics exemption examinations taken at entry.

Independent variables consisted of those listed in section II of this report, with the following modification:

- no setback data were available
- some additional data describing sex/race were available and were included where possible.

**PRESENTATION OF DATA**

For the discussion which follows, the data base includes the entire population wherever possible. However, caution should be used in interpreting data which relates certain background variables to performance in API and Primary Flight training. The Ns used in computing these data are often based on sample sizes which are less than that of the entire population. These data will be identified by inclusion of the N along with the mean. This difference in sample sizes is the result of merging different data bases in which there was not a direct correspondence of data elements. Nevertheless, the data should be sufficiently accurate for the identification of trends. Performance data are restricted to grades obtained in API and Primary Flight training. Attrition data, however, apply to the entire flight training pipeline for each class.

The mean API Navy standard score for all available cases was 51.60 (S.D. = 7.52, N = 2,174). Table 42 displays mean API standard scores and standard deviations for each NROTC unit for which representative data are available. These averages are based on Navy standard scores (mean = 50, S.D. = 10). The combined average of all unit scores is 53.34 (S.D. = 6.97, N = 840). Tables 43 and 44 provide similar statistics grouped by major field of study and class year. The trend in API Navy standard scores for sequential class years is slightly upward.

The mean Navy standard score in Primary Flight training for all cases was 51.23 (S.D. = 7.37, N = 1,380). Tables 45, 46, and 47 show the average Primary Flight training Navy standard score as a function of NROTC unit, major field of study, and class year, respectively, for available data. The trend in Primary Flight scores for sequential class years is slightly down.

Table 48 summarizes API and Primary Flight scores as a function of technical vs. nontechnical undergraduate majors. A summary of spatial apperception, math, and physics scores by unit and technical/nontechnical major are contained in tables 49 and 50. While there was a significant difference noted between some of these scores, the sample sizes were so small as to render these differences uninterpretable. However, a stepwise regression analysis which related the math, Spatial Apperception Test (SAT), and physics scores to student scores in API and in Primary Flight training showed that math scores accounted for 43 percent and 29 percent of the variance, respectively. Adding SAT and physics scores to the prediction equation accounted for relatively small amounts of additional variance.

Requirements for remediation in math or physics, as indicated by tests taken on entry, were not related to university characteristics. While there was a significant relationship between these scores and ethnic background, the small sample size for categories of ethnic background makes this relationship unreliable.

Attrition from class years 1977-1979, throughout the entire air training pipeline, was 45.1 percent. No data were available to discriminate among reasons for attrition. The only variable which showed a statistically

TABLE 42. AVERAGE API NAVY STANDARD SCORE BY NROTC UNIT

| COLLEGE | MEAN | STD DEV | N |
|---|---|---|---|
| AUBURN | 53.27 | 6.74 | 31 |
| U C BERKELEY | 57.26 | 4.81 | 18 |
| UCLA | 54.60 | 5.97 | 19 |
| CITADEL | 47.956 | 6.27 | 46 |
| U COLORADO | 54.69 | 5.27 | 26 |
| CORNELL | 59.14 | 3.30 | 14 |
| DUKE | 58.92 | 5.16 | 8 |
| U FLORIDA | 52.20 | 6.82 | 22 |
| FLORIDA A&M | 45.48 | 8.21 | 9 |
| GEORGIA TECH | 55.93 | 6.13 | 19 |
| HOLY CROSS | 50.15 | 7.90 | 11 |
| U IDAHO | 56.73 | 3.87 | 10 |
| IIT | 53.33 | 5.29 | 7 |
| U ILLINOIS | 53.76 | 9.26 | 7 |
| IOWA ST | 53.24 | 6.26 | 15 |
| JACKSONVILLE U | 51.12 | 5.69 | 23 |
| LOUISVILLE | 50.38 | 8.94 | 14 |
| U KANSAS | 52.44 | 8.74 | 15 |
| MAINE MARITIME | 58.08 | 5.42 | 4 |
| MARQUETTE | 53.90 | 5.90 | 14 |
| MIT | 64.67 | 1.15 | 3 |
| MIAMI U OHIO | 52.93 | 4.46 | 18 |
| U MICHIGAN | 58.87 | 4.65 | 10 |
| U MINNESOTA | 52.03 | 7.96 | 11 |
| U MISSISSIPPI | 48.96 | 6.73 | 14 |
| U MISSOURI | 53.62 | 5.83 | 21 |
| U NEBRASKA | 52.28 | 7.98 | 6 |
| U NEW MEXICO | 56.45 | 4.79 | 17 |
| N C CENTRAL | 44.44 | 2.22 | 3 |
| U N CAROLINA | 56.85 | 4.74 | 13 |
| NORTHWESTERN | 54.31 | 8.09 | 12 |
| NOTRE DAME | 55.27 | 5.66 | 21 |
| OHIO ST | 56.02 | 4.82 | 14 |
| U OKLAHOMA | 47.40 | 6.91 | 10 |
| OREGON ST | 51.36 | 6.28 | 23 |
| PENN ST | 54.77 | 5.54 | 25 |
| U PENNSYLVANIA | 49.67 | 8.69 | 8 |
| PRAIRIE VIEW | 37.67 | 6.66 | 3 |
| PURDUE | 55.56 | 4.01 | 18 |
| RPI | 55.54 | 3.47 | 16 |
| RICE | 50.61 | 8.13 | 6 |
| U ROCHESTER | 54.60 | 5.70 | 16 |
| U S CAROLINA | 51.98 | 7.73 | 20 |
| USC | 52.63 | 8.74 | 19 |
| SOUTHERN A&M | 30.67 | 0.0 | 1 |
| TEXAS A&M | 53.60 | 7.10 | 39 |
| TEXAS | 56.36 | 6.76 | 14 |
| TULANE | 50.92 | 7.88 | 13 |
| U UTAH | 53.27 | 8.96 | 5 |
| VANDERBILT | 55.35 | 6.46 | 17 |
| VILLANOVA | 50.68 | 6.50 | 24 |
| U VIRGINIA | 55.37 | 5.88 | 25 |
| U WASHINGTON | 59.66 | 3.57 | 18 |
| U WISCONSIN | 51.44 | 5.67 | 9 |
| SUNY MARITIME | 55.50 | 5.80 | 4 |
| VMI | 48.11 | 8.21 | 12 |
| Average | 53.34 | 6.97 | 840 |

TABLE 43. AVERAGE API NAVY STANDARD SCORE BY MAJOR

| MAJOR | MEAN | STD DEV | N |
|---|---|---|---|
| AGRICULT | 43.00 | 0.0 | 1 |
| FORESTRY | 52.12 | 5.76 | 23 |
| MISC AGR | 47.47 | 7.68 | 10 |
| SCIENCES | 53.84 | 6.71 | 91 |
| BIOL SCI | 50.30 | 7.19 | 27 |
| ANIM GEN | 52.00 | 0.0 | 1 |
| ZOOLOGY | 52.58 | 4.65 | 7 |
| MISC BIO | 52.50 | 17.68 | 2 |
| MEDICINE | 56.81 | 4.86 | 7 |
| GEOLOGY | 53.38 | 7.52 | 8 |
| OPS RSCH | 57.50 | 2.12 | 2 |
| METEORL | 62.33 | 0.0 | 1 |
| CHEMISTRY | 53.50 | 5.58 | 6 |
| BIOCHEM | 53.00 | 5.66 | 2 |
| CERAMICS | 59.00 | 0.0 | 1 |
| MATH | 53.42 | 6.1 | 24 |
| PHYSICS | 56.91 | 5.96 | 11 |
| PHYS SCI | 52.62 | 6.57 | 84 |
| CIV ENG | 53.69 | 4.91 | 13 |
| COMP SCI | 51.94 | 6.68 | 15 |
| NAV ARCH | 57.00 | 8.00 | 5 |
| NUC ENG | 56.00 | 0.00 | 1 |
| ORD ENG | 59.00 | 4.24 | 2 |
| INDS ENG | 53.42 | 3.97 | 8 |
| CHEM ENG | 53.50 | 0.71 | 2 |
| ELEC ENG | 56.53 | 5.56 | 19 |
| MECH ENG | 57.88 | 4.96 | 24 |
| ELEX ENG | 40.00 | 0.0 | 1 |
| COMM ENG | 43.00 | 0.0 | 1 |
| AERO ENG | 56.19 | 6.31 | 55 |
| METL ENG | 57.00 | 0.0 | 1 |
| ARCHITCT | 53.12 | 5.59 | 8 |
| ENGINEER | 55.93 | 5.49 | 220 |
| FRGN AFF | 48.39 | 13.81 | 6 |
| POLY SCI | 48.79 | 7.18 | 19 |
| PUB ADM | 42.20 | 9.04 | 5 |
| INDS ART | 50.07 | 9.51 | 10 |
| HISTORY | 52.33 | 7.09 | 18 |
| INDS MGT | 52.43 | 3.78 | 7 |
| PERS ADM | 38.00 | 0.0 | 1 |
| PSYCHOL | 50.04 | 6.19 | 66 |
| ANTHROPL | 49.50 | 4.95 | 2 |
| ECONOMICS | 53.64 | 8.11 | 14 |
| ACCOUNTG | 53.97 | 6.41 | 13 |
| GEOGRAPH | 49.50 | 12.02 | 2 |
| BUS ECON | 57.50 | 6.36 | 2 |
| BUS ADM | 51.90 | 7.03 | 234 |
| PHYS ED | 50.66 | 8.58 | 35 |
| EDUCATION | 49.60 | 7.90 | 34 |
| JOURNL | 50.48 | 10.37 | 9 |
| LAW | 51.00 | 0.0 | 1 |
| STAT | 47.00 | 0.0 | 1 |
| SOC WORK | 46.00 | 0.0 | 1 |
| SOC SCI | 50.07 | 7.60 | 207 |
| FINE ARTS | 50.42 | 3.59 | 4 |
| ENGLISH | 50.96 | 7.89 | 39 |
| CLASSIC | 45.50 | 16.26 | 2 |
| MAJOR Not Elsewhere Classified | 50.74 | 8.74 | 13 |
| Average | 52.56 | 7.22 | 1,428 |

TABLE 44. AVERAGE API NAVY STANDARD SCORE BY CLASS

| CLASS | MEAN | STD DEV | VARIANCE | N |
|---|---|---|---|---|
| 7900 | 52.56 | 6.94 | 48.11 | 687 |
| 7800 | 51.34 | 7.46 | 55.62 | 754 |
| 7700 | 50.97 | 8.10 | 65.58 | 733 |
| Average | 51.60 | 7.55 | 57.00 | 2,174 |

TABLE 45. AVERAGE PRIMARY FLIGHT NAVY STANDARD SCORE BY UNIT

| COLLEGE | MEAN | STD DEV | N |
|---|---|---|---|
| AUBURN | 53.77 | 5.74 | 22 |
| U C BERKELEY | 52.59 | 6.38 | 13 |
| UCLA | 52.98 | 6.77 | 11 |
| CITADEL | 48.54 | 7.67 | 22 |
| U COLORADO | 51.98 | 6.62 | 18 |
| CORNELL | 56.03 | 5.36 | 9 |
| DUKE | 60.22 | 6.69 | 4 |
| U FLORIDA | 50.90 | 4.52 | 13 |
| FLORIDA A&M | 48.58 | 4.51 | 6 |
| GEORGIA TECH | 55.04 | 3.29 | 13 |
| HOLY CROSS | 52.83 | 7.06 | 9 |
| U IDAHO | 55.31 | 6.65 | 8 |
| IIT | 50.47 | 5.50 | 5 |
| U ILLINOIS | 54.70 | 6.49 | 5 |
| IOWA ST | 52.76 | 6.84 | 12 |
| JACKSONVILLE | 49.78 | 6.03 | 17 |
| LOUISVILLE | 52.54 | 3.47 | 9 |
| U KANSAS | 55.56 | 4.14 | 12 |
| MAINE MARITIME | 55.01 | 1.97 | 2 |
| MARQUETTE | 53.48 | 7.52 | 5 |
| MIT | 59.11 | 1.13 | 3 |
| MIAMI U OHIO | 51.16 | 6.92 | 14 |
| U MICHIGAN | 56.07 | 4.48 | 8 |
| U MINNESOTA | 52.40 | 7.68 | 6 |
| U MISSISSIPPI | 45.66 | 8.80 | 10 |
| U MISSOURI | 52.67 | 5.81 | 15 |
| U NEBRASKA | 49.92 | 9.50 | 5 |
| U NEW MEXICO | 56.82 | 3.24 | 14 |
| N C CENTRAL | 48.00 | 14.63 | 2 |
| U N CAROLINA | 53.49 | 7.00 | 9 |
| NORTHWESTERN | 53.45 | 7.80 | 10 |
| NOTRE DAME | 55.42 | 6.52 | 12 |
| OHIO ST | 54.28 | 3.53 | 7 |
| U OKLAHOMA | 46.76 | 10.55 | 6 |
| OREGON ST | 49.97 | 5.08 | 13 |
| PENN ST | 54.52 | 5.74 | 16 |
| U PENNSYLVANIA | 47.02 | 12.81 | 2 |
| PRAIRIE VIEW | 46.72 | 3.49 | 2 |
| PURDUE | 55.49 | 4.75 | 13 |
| RPI | 55.72 | 5.15 | 11 |
| RICE | 52.64 | 2.84 | 5 |
| U ROCHESTER | 56.13 | 2.06 | 11 |
| U S CAROLINA | 51.15 | 8.31 | 16 |
| USC | 53.64 | 5.57 | 10 |
| TEXAS A&M | 50.75 | 7.05 | 29 |
| TEXAS | 52.87 | 6.82 | 7 |
| TULANE | 54.10 | 2.67 | 4 |
| U UTAH | 52.41 | 7.01 | 4 |
| VANDERBILT | 55.28 | 5.74 | 8 |
| VILLANOVA | 51.85 | 8.74 | 13 |
| U VIRGINIA | 54.20 | 5.62 | 13 |
| U WASHINGTON | 56.06 | 5.90 | 9 |
| U WISCONSIN | 49.37 | 3.35 | 3 |
| VMI | 48.89 | 6.58 | 7 |
| Average | 52.74 | 6.54 | 532 |

TABLE 46. AVERAGE PRIMARY FLIGHT NAVY STANDARD SCORE BY COLLEGE MAJOR

| MAJOR | MEAN | STD DEV | N |
|---|---|---|---|
| AGRICULT | 43.94 | 0.0 | 1 |
| FORESTRY | 47.88 | 5.64 | 12 |
| MISC AGR | 51.70 | 3.85 | 6 |
| SCIENCES | 52.69 | 5.78 | 51 |
| BIOL SCI | 51.66 | 6.71 | 22 |
| ANIM GEN | 47.67 | 0.0 | 1 |
| ZOOLOGY | 52.03 | 4.03 | 7 |
| MISC BIO | 60.39 | 0.0 | 1 |
| MEDICINE | 53.34 | 5.07 | 4 |
| GEOLOGY | 53.22 | 6.79 | 8 |
| OPS RSCH | 54.88 | 5.08 | 2 |
| CHEMISTRY | 51.01 | 8.63 | 6 |
| BIOCHEM | 57.62 | 0.0 | 1 |
| CERAMICS | 57.65 | 0.0 | 1 |
| MATH | 53.49 | 6.32 | 22 |
| PHYSICS | 56.38 | 6.20 | 9 |
| PHYS SCI | 51.06 | 7.12 | 41 |
| CIV ENG | 54.42 | 6.03 | 12 |
| COMP SCI | 55.13 | 3.86 | 4 |
| NAV ARCH | 59.38 | 2.88 | 3 |
| NUC ENG | 50.60 | 0.0 | 1 |
| ORD ENG | 59.60 | 4.55 | 2 |
| INDS ENG | 52.68 | 7.62 | 6 |
| CHEM ENG | 49.30 | 0.59 | 2 |
| ELEC ENG | 55.28 | 6.24 | 15 |
| MECH ENG | 57.31 | 3.56 | 21 |
| ELEX ENG | 49.47 | 0.0 | 1 |
| COMM ENG | 46.96 | 0.0 | 1 |
| AERO ENG | 54.32 | 6.82 | 33 |
| METL ENG | 51.22 | 0.0 | 1 |
| ARCHITCT | 54.50 | 5.45 | 6 |
| ENGINEER | 52.52 | 5.92 | 103 |
| FRGN AFF | 53.22 | 7.78 | 4 |
| POLY SCI | 47.33 | 7.13 | 15 |
| PUB ADM | 47.56 | 4.96 | 4 |
| INDS ART | 45.74 | 8.36 | 6 |
| HISTORY | 51.85 | 8.01 | 11 |
| INDS MGT | 54.46 | 6.38 | 6 |
| PERS ADM | 53.93 | 0.0 | 1 |
| PSYCHOL | 48.94 | 8.48 | 32 |
| ANTHROPL | 54.84 | 3.47 | 2 |
| ECONOMICS | 56.96 | 3.68 | 11 |
| ACCOUNTG | 57.86 | 4.76 | 11 |
| GEOGRAPH | 52.10 | 9.24 | 2 |
| BUS ECON | 58.45 | 1.95 | 2 |
| BUS ADM | 50.88 | 6.05 | 122 |
| PHYS ED | 49.62 | 6.60 | 19 |
| EDUCATION | 49.48 | 4.43 | 21 |
| JOURNL | 52.74 | 5.17 | 6 |
| LAW | 44.31 | 0.0 | 1 |
| STAT | 45.78 | 0.0 | 1 |
| SOC WORK | 53.71 | 0.0 | 1 |
| SOC SCI | 48.31 | 7.14 | 100 |
| FINE ARTS | 48.34 | 8.39 | 2 |
| ENGLISH | 48.55 | 7.64 | 18 |
| CLASSIC | 55.61 | 0.0 | 1 |
| MAJOR NOT ELSEWHERE CLASSIFIED | 53.31 | 4.54 | 6 |
| Average | 51.59 | 6.72 | 811 |

TABLE 47. AVERAGE PRIMARY FLIGHT NAVY STANDARD SCORE BY SEQUENTIAL CLASS YEAR

| CLASS | MEAN | STD DEV | N |
|---|---|---|---|
| 7900 | 49.18 | 6.76 | 219 |
| 7800 | 50.88 | 6.91 | 585 |
| 7700 | 52.37 | 7.83 | 576 |
| Average | 51.24 | 7.37 | 1,380 |

TABLE 48. AVERAGE API AND PRIMARY FLIGHT NAVY STANDARD SCORES BY TECHNICAL VS. NONTECHNICAL MAJORS

| | API | | | PRIMARY FLIGHT | | |
|---|---|---|---|---|---|---|
| | MEAN | STD DEV | N | MEAN | STD DEV | N |
| Technical | 54.69 | 6.27 | 649 | 53.20 | 6.20 | 387 |
| Nontechnical | 50.79 | 7.5 | 779 | 50.12 | 6.85 | 424 |

TABLE 49. MEAN SPATIAL APPERCEPTION TEST, PHYSICS, AND MATH SCORES IN API BY COLLEGE

| COLLEGE | SAT MEAN | SAT STD DEV | PHYSICS MEAN | PHYSICS STD DEV | MATH MEAN | MATH STD DEV |
|---|---|---|---|---|---|---|
| AUBURN | 12.90 | 3.04 | 55.87 | 7.07 | 50.91 | 8.01 |
| U C BERKELEY | 12.59 | 3.34 | 58.36 | 5.60 | 53.07 | 8.99 |
| UCLA | 10.74 | 2.67 | 57.00 | 4.16 | 54.46 | 8.63 |
| CITADEL | 10.36 | 3.34 | 52.37 | 6.89 | 48.67 | 10.57 |
| U COLORADO | 12.08 | 3.20 | 57.96 | 4.04 | 57.52 | 5.88 |
| CORNELL | 10.40 | 2.44 | 59.55 | 4.32 | 60.09 | 5.70 |
| DUKE | 12.11 | 3.26 | 60.33 | 2.16 | 57.67 | 8.29 |
| U FLORIDA | 11.04 | 3.04 | 55.94 | 4.09 | 51.44 | 8.21 |
| FLORIDA | 9.30 | 3.06 | 44.75 | 10.42 | 37.62 | 6.44 |
| GEORGIA TECH | 11.79 | 3.26 | 57.94 | 7.25 | 58.94 | 8.60 |
| HOLY CROSS | 10.00 | 3.69 | 54.12 | 7.51 | 52.75 | 9.13 |
| U IDAHO | 11.90 | 3.14 | 60.00 | 3.00 | 59.86 | 7.73 |
| IIT | 9.29 | 1.98 | 57.50 | 4.65 | 54.00 | 8.52 |
| U ILLINOIS | 11.43 | 4.65 | 57.20 | 4.76 | 58.60 | 8.02 |
| IOWA ST | 11.36 | 3.13 | 56.73 | 6.51 | 56.36 | 6.74 |
| JACKSONVILLE U | 11.26 | 3.11 | 54.56 | 5.00 | 50.33 | 7.87 |
| LOUISVILLE | 10.07 | 3.34 | 55.67 | 5.91 | 55.08 | 8.37 |
| U KANSAS | 12.27 | 2.79 | 53.92 | 7.81 | 54.00 | 8.60 |
| MAINE MARITIME | 12.00 | 1.63 | 62.00 | 1.41 | 59.50 | 0.71 |
| MARQUETTE | 10.00 | 3.40 | 57.00 | 4.08 | 56.50 | 7.68 |
| MIT | 14.67 | 4.16 | 62.50 | 0.71 | 62.50 | 4.95 |
| MIAMI U OHIO | 11.06 | 2.98 | 55.86 | 6.98 | 52.71 | 9.50 |
| U MICHIGAN | 11.40 | 2.72 | 58.43 | 4.76 | 54.86 | 6.52 |
| U MINNESOTA | 12.00 | 2.00 | 57.25 | 2.19 | 53.38 | 7.11 |
| U MISSISSIPPI | 13.07 | 2.43 | 52.55 | 6.28 | 51.36 | 8.45 |
| U MISSOURI | 12.23 | 3.24 | 55.73 | 4.56 | 55.87 | 7.67 |
| U NEBRASKA | 14.67 | 3.27 | 53.50 | 6.56 | 54.50 | 7.90 |
| U NEW MEXICO | 12.41 | 3.32 | 58.31 | 3.97 | 56.62 | 9.90 |
| N C CENTRAL | 13.00 | 4.36 | 44.00 | 11.31 | 44.50 | 6.36 |
| U N CAROLINA | 12.08 | 3.04 | 58.83 | 2.98 | 56.75 | 5.75 |
| NORTHWESTERN | 12.00 | 3.16 | 56.10 | 6.17 | 53.70 | 8.52 |
| NOTRE DAME | 12.24 | 3.14 | 58.64 | 3.67 | 57.18 | 10.52 |
| OHIO ST | 13.50 | 2.47 | 59.89 | 3.62 | 56.44 | 7.80 |
| U OKLAHOMA | 13.70 | 2.95 | 51.57 | 6.50 | 46.43 | 7.57 |
| OREGON ST | 11.87 | 3.15 | 52.62 | 7.82 | 48.31 | 7.00 |
| PENN ST | 10.08 | 4.00 | 55.82 | 6.22 | 53.65 | 11.37 |
| U PENNSYLVANIA | 10.75 | 2.49 | 49.50 | 13.13 | 49.00 | 11.92 |
| PRAIRIE VIEW | 13.00 | 4.36 | 39.00 | 15.56 | 53.50 | 9.19 |
| PURDUE | 11.06 | 2.94 | 58.43 | 2.93 | 61.21 | 3.77 |
| RPI | 11.56 | 2.99 | 59.20 | 3.61 | 58.00 | 7.47 |
| RICE | 12.17 | 1.17 | 59.50 | 3.79 | 54.50 | 5.20 |
| U ROCHESTER | 11.94 | 2.77 | 56.50 | 6.70 | 58.90 | 5.70 |
| U S CAROLINA | 12.00 | 2.97 | 56.85 | 3.36 | 54.54 | 8.16 |
| USC | 12.10 | 4.33 | 54.00 | 7.99 | 52.00 | 10.60 |
| SOUTHERN A&M | 13.00 | 0.0 | -- | -- | -- | -- |
| TEXAS A&M | 12.13 | 3.48 | 56.56 | 5.11 | 53.63 | 8.58 |
| TEXAS | 13.07 | 3.29 | 58.57 | 4.65 | 59.71 | 6.15 |
| TULANE | 12.69 | 2.78 | 57.67 | 4.32 | 52.50 | 14.43 |
| U UTAH | 12.20 | 2.28 | 52.80 | 8.04 | 52.80 | 9.78 |
| VANDERBILT | 13.61 | 3.58 | 58.50 | 3.92 | 53.50 | 8.27 |
| VILLANOVA | 12.00 | 3.50 | 54.88 | 5.82 | 53.00 | 7.45 |
| U VIRGINIA | 12.52 | 2.71 | 58.31 | 3.09 | 57.15 | 7.97 |
| U WASHINGTON | 13.47 | 3.56 | 58.23 | 3.76 | 57.15 | 8.31 |
| U WISCONSIN | 11.56 | 2.96 | 55.20 | 3.77 | 52.20 | 16.21 |
| SUNY MARITIME | 9.25 | 2.22 | 56.00 | 0.0 | 50.00 | 0.0 |
| VMI | 11.23 | 3.70 | 50.60 | 9.50 | 49.00 | 11.85 |
| Average | 11.78 | 3.26 | 56.12 | 6.20 | 54.02 | 9.04 |

significant relationship to attrition was technical or nontechnical undergraduate major ($X^2 = 15.73$, $p > .001$). Fifty-five percent of nontechnical majors attrited while 45.3 percent of the technical majors attrited. The total N of 1,456 would seem to assure that this is a reasonably reliable result; however, conclusions as to the importance of academic preparation in this difference should be inferred with care.

API, physics, and math exemption scores and attrition data for institutional variables are provided in table 51. Institutional rank (competitiveness) data continue to reflect scores that parallel rank; NROTC graduates representing institutions with a strong LAS emphasis and those from institutions in the SE geographic area performed less well than their counterparts in other categories of these variables. A consistently lower performance by students from schools with less than 5,000 students was also observed. Differences noted between schools with predominately minority or majority student populations were also observed but should be viewed with caution because of the low number of cases available to describe minority schools.

TABLE 50. SPATIAL APPERCEPTION TEST, PHYSICS, AND MATH SCORES IN API BY TECHNICAL OR NONTECHNICAL MAJOR

| | SAT | | PHYSICS | | MATH | |
|---|---|---|---|---|---|---|
| | MEAN | STD DEV | MEAN | STD DEV | MEAN | STD DEV |
| Technical | 12.01 | 3.34 | 57.71 | 5.18 | 56.47 | 7.79 |
| Nontechnical | 11.81 | 3.08 | 51.97 | 7.97 | 50.45 | 9.51 |
| Average | 11.90 | 3.20 | 54.62 | 7.40 | 53.24 | 9.25 |

TABLE 51. AVIATION POST-ACCESSION PERFORMANCE BY INSTITUTIONAL CHARACTERISTICS

| INSTITUTIONAL CHARACTERISTIC | CATEGORY* (N) | MEAN API(NSS) | PHYSICS EXEMPTION SCORE | MATH EXEMPTION SCORE | PERCENT ATTRITES |
|---|---|---|---|---|---|
| Rank | | | | | |
| | Most Competitive (3) | 64.67 | 62.50 | 62.50 | 66.7 |
| | Highly Competitive (89) | 55.34 | 58.00 | 56.57 | 38.5 |
| | Very Competitive (198) | 55.18 | 57.70 | 55.88 | 45.0 |
| | Competitive (485) | 52.30 | 55.42 | 53.12 | 45.9 |
| | Less Competitive (3) | 50.42 | 51.91 | 48.0 | 38.7 |
| | Noncompetitive (35) | 53.84 | 56.00 | 54.96 | 37.1 |
| Environment | | | | | |
| | Suburban (456) | 52.97 | 55.94 | 53.86 | 43.8 |
| | Urban (342) | 53.72 | 56.37 | 54.22 | 45.0 |
| | Rural (42) | 54.33 | 56.10 | 54.17 | 45.2 |
| Type | | | | | |
| | University (695) | 53.70 | 56.29 | 54.23 | 42.8 |
| | Technical (65) | 54.62 | 57.68 | 56.95 | 51.5 |
| | LAS (80) | 49.17 | 53.37 | 49.85 | 52.5 |
| Salary | | | | | |
| | High (325) | 54.09 | 56.80 | 55.00 | 44.4 |
| | Average (174) | 53.49 | 56.33 | 54.33 | 50.9 |
| | Low (341) | 52.55 | 55.39 | 52.97 | 41.0 |

*Ns shown apply to API and may vary slightly for other columns.

TABLE 51. AVIATION POST ACCESSION PERFORMANCE BY INSTITUTIONAL CHARACTERISTICS (continued)

| INSTITUTIONAL CHARACTERISTIC | CATEGORY* (N) | MEAN API(NSS) | PHYSICS EXEMPTION SCORE | MATH EXEMPTION SCORE | PERCENT ATTRITES |
|---|---|---|---|---|---|
| Size | | | | | |
| | Less than 5K (157) | 50.67 | 54.07 | 50.36 | 51.3 |
| | Less than 10K (219) | 54.08 | 56.78 | 55.52 | 46.8 |
| | Less than 15K (150) | 52.94 | 55.26 | 53.31 | 42.1 |
| | Less than 20K (163) | 53.79 | 56.59 | 54.26 | 34.1 |
| | Greater than 20K (151) | 54.95 | 57.54 | 56.01 | 46.7 |
| Coeducational Status | | | | | |
| | Coed (813) | 53.39 | 56.14 | 54.05 | 43.8 |
| | Male (27) | 52.04 | 55.25 | 52.50 | 60.7 |
| Geography | | | | | |
| | NE (125) | 54.19 | 56.46 | 55.55 | 48.4 |
| | W (239) | 54.00 | 56.22 | 53.92 | 42.9 |
| | MW (189) | 54.18 | 56.85 | 55.77 | 38.9 |
| | SE (287) | 51.87 | 55.42 | 52.35 | 47.3 |
| Control | | | | | |
| | Public (660) | 53.35 | 56.06 | 53.91 | 43.2 |
| | Private (110) | 53.75 | 56.60 | 54.48 | 47.2 |
| | Catholic (70) | 52.62 | 55.97 | 54.45 | 50.0 |
| Ethnic | | | | | |
| | Nonminority (827) | 53.51 | 56.34 | 54.32 | 44.1 |
| | Minority (13) | 42.54 | 43.60 | 36.80 | 57.1 |

# SECTION VIII

# SUMMARY

## SUMMARY OF DATA

This section provides an overview of the data presented in sections III through VII. Several issues of importance related to the performance of NROTC graduates are also presented.

Table 52 provides an overall summary of the performance of NROTC graduates at each of the Navy's initial post-accession training programs. Cells in this matrix showing incomplete or unavailable data should be targeted for special emphasis in future data acquisition efforts. Based on these data, NROTC graduates appear to have demonstrated a consistently satisfactory level of performance in the post-accession training programs reviewed. Cumulative mean GPAs are well above established pass/fail scores and show minimal deviation from computed or school-estimated GPA for students from all accession programs. Because grading differs, at the five follow-on programs, comparison of GPA by program should be avoided; translations between 4.0 and 100 point scales are not always exact. The development of Navy standard scores, as used to describe performance in aviation post-accession training, may provide a means of more accurate comparison.

TABLE 52. A PERFORMANCE MATRIX FOR NROTC GRADUATES BY POST-ACCESSION TRAINING

| PERFORMANCE CRITERIA | SWOS (N=1,138) | SUPPLY CORPS (N=449) | SUB SCHOOL (N=296) | NUCLEAR POWER (N=544) | AVIATION (N=2,174) |
|---|---|---|---|---|---|
| Cumulative GPA | 3.50 | 88.65 | 81.99 | 3.22 | 51.60* |
| % Attrite | 2.81 | Insufficient Data | Insufficient Data | 8.50 | 51.2 |
| % Setback | 7.64 | Insufficient Data | Insufficient Data | Data Unavail. | Data Unavail. |
| Reading Score Grade Level | Data Unavail. | 14.77 | Data Unavail. | Data Unavail. | Data Unavail. |
| Class Standing (% in top half) | Data Unavail. | 49.2 | 49.6 | 49.1 | Data Unavail. |
| Trend in GPA | Steady | Steady | Slight Down | Steady | Slight Up |

*Navy standard score.

Findings describing the class standing of NROTC graduates as compared to other accession program graduates are consistent with GPA results. Assuming a normal representation of aptitude among NROTC graduates in post-accession training, approximately half would be expected to stand in the top 50 percent of their respective classes. This expectation was verified. Trends, measured by class year, show steady or only slight up or down movement of GPAs/class standing over time.

The attrition and setback data in this study for SWOS Basic and the attrition data for Nuclear Power School and Aviation Preflight are more equivocal in that data from separate, independently obtained studies are not in complete agreement with those reported here. These data must, therefore, be viewed cautiously. Also, data do not discriminate among the various categories usually associated with attrition or setback (e.g., academic, aptitude, physical) for any post-accession program; thus, specific inferences about attrition/setback based on purely academic grounds are not possible.

At project start, reading scores were expected to be available for use as both performance and moderator variables. However, such scores were available only for Supply Corps Basic School students. In the future, use of reading scores will be possible on a much larger scale as a comprehensive testing program is initiated at all NROTC units.

Table 53 summarizes the performance of NROTC graduates grouped by technical/nontechnical major field of undergraduate academic study at the various follow-on schools. In almost every comparison, using GPA or class standing criteria, persons with technical backgrounds performed better, although in many cases the practical difference between scores was so small as to be negligible. Attrition data (and setback data where available) show significantly greater losses per class among nontechnically trained students. The consistency of these data suggest that the trend is valid, even though the absolute level of performance reflected may not be precise.

A variety of institutional data was used to compare the performance of NROTC graduates in each post-accession training program. Among these variables, Rank (based on Barron's competitive levels of entering students), Type (multiversity, technical emphasis, liberal arts emphasis) and Ethnic Predominance were most likely to evoke consistent differences in performance during post-accession training. In general, the higher the ranking of an institution, the better the performance of its graduates; technical institution graduates did better, liberal arts institution graduates did less well; graduates of institutions with predominately minority student bodies demonstrated poorer performance than did their counterparts from predominately white institutions. An overview of institutional variables which appear to relate to performance in post-accession training is provided by table 54.

TABLE 53. SUMMARY OF TECHNICAL/NONTECHNICAL GROUP PERFORMANCE

| PERFORMANCE CRITERIA | TECHNICAL MAJOR (N) | NONTECHNICAL MAJOR (N) |
|---|---|---|
| SWOS | | |
| Pretest GPA | 1.66 (509) | 1.50 (460) |
| CT GPA | 3.54 (481) | 3.46 (405) |
| % Attrite | Insufficient data | Insufficient data |
| % Setback | 3.9 (509) | 10.4 (460) |
| Supply | | |
| GPA | 88.51 (97) | 88.33 (387) |
| Reading Grade Level | 14.86 (68) | 14.81 (181) |
| Class Standing | 54.1* (98) | 49.1* (391) |
| Sub School | | |
| GPA | 81.16 (116) | 79.72 (23) |
| Class Standing | 54.0* (115) | 26.0* (23) |
| Nuclear Power School | | |
| GPA | 3.22 (272) | 3.16 (15) |
| Class Standing | 46.9* (264) | 46.7* (15) |
| % Attrite | 13.4 (305) | 25.0 (20) |
| Aviation | | |
| API NSS | 55.69 (649) | 50.79 (779) |
| Primary Flight NSS | 53.20 (387) | 50.12 (424) |
| Physics Exemption Test | 57.71 | 51.97 |
| Math Exemption Test | 56.47 | 50.45 |
| % Attrition | 44.8** (653) | 55.0** (803) |

*Percent in top half.
**Throughout entire pipeline.

TABLE 54. MATRIX OF SIGNIFICANT DIFFERENCES* AMONG INSTITUTIONAL VARIABLES BY POST-ACCESSION TRAINING

| INSTITUTIONAL VARIABLES | SWOS | | SUPPLY CORPS | | SUB SCHOOL | NUCLEAR POWER | AVIATION |
|---|---|---|---|---|---|---|---|
| | AVG PT | AVG CT | GPA | READ | | | |
| Rank | X | X | | X | | | X |
| Environment | | | | | | | |
| Type | X | | X | | | | X |
| Salary | X | | | | | | |
| Size | | | | | | | |
| Coeducational Status | X | | | | | | |
| Geographic Location | | | | | | | X |
| Control | | | X | | | | |
| Ethnic Predominance | | X | | X** | | | X** |

*All signigicant differences are reported at $p > .01$.
**Relatively low number of cases (N).

## FUTURE CONSIDERATIONS

Areas for improvement in the effort to acquire and analyze data describing NROTC graduate performance in post-accession training include:

- developing attrition and setback information for those follow-on programs where it is not currently available and measuring the accuracy of these data where they are available
- developing class standing data for SWOS and aviation post-accession programs
- using recently implemented NROTC comprehensive test data, including reading scores and comprehensive test scores, to provide additional indication of NROTC graduate performance
- reducing the number of institutional variables reviewed to assess impact on post-accession performance to include competitive ranking, institutional type, and ethnic predominance.

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## APPENDIX A

## NROTC CORE CURRICULUM COURSE REQUIREMENTS

The NROTC Core Curriculum consists of the requirements/courses listed below. Students enrolled under this program may select any major field of study leading to the baccalaureate degree. In addition to those requirements/courses normally associated with the degree program chosen, the student will complete the following as part of, or in addition to, that program:

American Military Affairs (1 semester/term)
Calculus (1 year)
Physics (1 year; calculus based)
Three of the following (1 semester/term each):

- Applied Mathematics
- Advanced Statistics
- Computer Science
- Additional Science

English (1 year)
Modern Foreign Language (1 semester/term; mandated by Congress)

Table A-1 provides a comparison of the current requirements levied on NROTC students and those of the "core" curriculum pilot program.

TABLE A-1. COMPARISON OF CORE AND PRESENT CURRICULAR REQUIREMENTS

| REQUIREMENT | CORE | PRESENT |
|---|---|---|
| Major | Any | 80% technical<br>20% of interest to Navy |
| Naval Science Courses | X | X |
| American Military Affairs | X | X |
| National Security Policy | | X |
| Calculus (1 Year) | X | X |
| Physics (1 Year; Calculus Based) | X | X |
| English (1 Year) | X | |
| *Modern Foreign Language (1 Term) | X | X |
| Other Course Requirements | 3 of 4 listed | 2 approved by PNS |

*Congressional mandate for all DOD scholarship programs.

## APPENDIX B

## DATA ELEMENTS LIST BY SOURCE

NROTC ADS (current)

Active Duty Status (shows previous branch of service)
Alien Status
Attrition Cause
Attrition Date
Birth Date
Calculus/Physics (shows completion)
Changes Option (between Navy/ Marine Corps options)
Class
College Program (College vs. Scholarship programs)
Cross Enrollment
Cruise (projected cruise year)
Designator Choices
Designator Code (prospective)
End of Obligated Service (EOS) Date
Enrollment Date
Estimated Commissioning Date
Ethnic Group
Final Major
First Name
Former Program Code
Home State
Initial Major
Last Name
Leave of Absence Indicator
Middle Initial
Nuclear Candidate
Officer Candidate Date of Commitment
Option Code (Select Navy or Marine Corps)
Physical Fitness Test Score
Physical Status
Probation Status
Race
SAT Composite Score (includes ACT equivalent)
SAT Math Score (includes ACT equivalent)
SAT Verbal Score (includes ACT equivalent)
School Code (university/college attending)
Selection Code
Selection Scale
Sex
Social Security Number

NRC (current)

Age
SAT (Verbal, Math, Composite)
ACT English
Math
Social Science
Natural Science
Selection Code
College Assigned
Rank in (H.S.) Class
Class Size (H.S.)
H. S. Rating
Interview
College Choices
Military Dependent
School Officer
Varsity Athletics
Eagle Scout
Boy's/Girl's State
NJROTC
NROTC
National Honor Society
Academic Awards/Medals
Class Rank
College Major Desired
SVIB
Officer Potential _____
Overall Index
College GPA

NPRDC (historical) Data elements included in NROTC ADS.

OCARS (historical) Data elements included in NROTC ADS.

Follow-on Schools (historical; current)

| SWOS | SUB | NUC | Supply | Air |
|---|---|---|---|---|
| GPA | GPA | GPA | GPA | API |
| PT (1-21) | | Special | Standing | Primary Flight |
| CX (1-21) | | Subjects (1-8) | Reading | Physics Exempt |
| CT (1-21) | | Standing | | Math Exempt |
| | | | | Math Exempt |

Institutional Data

| | |
|---|---|
| Rank | Coed Composition |
| Environ | Size |
| Type | Ethnic Composition |
| Salary | |
| Control | |
| Geography | |

# APPENDIX C

## INSTITUTIONAL VARIABLES/ASSIGNMENT

Table C-1 lists those institutions assigned to each of the categories identified in the column header. The following key describes the numbers assigned.

**Geography**

1 - Northwest
2 - West
3 - Midwest
4 - Southeast

**Type**

1 - Multipurpose University
2 - Technical (primary)
3 - LAS (primary)

**Environment**

1 - Suburban
2 - Urban
3 - Rural

**Control**

1 - public
2 - private
3 - Catholic

**Salary**

1 - high
2 - average
3 - low

**Ethnic/Coeducational Status**

M - predominate minority enrollment
Male - predominate male enrollment

**Size**

1 - less than 5,000 students
2 - 5-10,000 students
3 - 10-15,000 students
4 - 15-20,000 students
5 - greater than 20,000 students

**Rank**

1 - most competitive
2 - highly competitive
3 - very competitive
4 - competitive
5 - less competitive
6 - noncompetitive

TABLE C-1. NUMERICAL CODES FOR INSTITUTIONAL VARIABLES

| COLLEGE | GEO | RANK | ENVIR | TYPE | SAL | CONTROL | SIZE | ETHNIC/ COED |
|---|---|---|---|---|---|---|---|---|
| Auburn | 4 | 4 | 1 | 1 | 3 | 1 | 4 | |
| U C Berkeley | 2 | 3 | 2 | 1 | 1 | 1 | 4 | |
| UCLA | 2 | 4 | 1 | 1 | 1 | 1 | 5 | |
| Citadel | 4 | 4 | 1 | 3 | 2 | 1 | 1 | |
| U Colorado | 2 | 4 | 1 | 1 | 3 | 1 | 4 | |
| Cornell | 1 | 2 | 2 | 1 | 1 | 1 | 3 | |
| Duke | 4 | 2 | 2 | 1 | 1 | 1 | 2 | |
| U. Florida | 4 | 4 | 1 | 1 | 3 | 1 | 5 | |
| Florida A&M | 4 | 5 | 2 | 1 | 3 | 1 | 1 | M |
| Georgia Tech | 4 | 3 | 2 | 2 | 3 | 1 | 2 | |
| Holy Cross | 1 | 3 | 2 | 3 | 1 | 3 | 1 | |
| U. Idaho | 2 | 4 | 3 | 1 | 3 | 1 | 2 | |
| IIT | 3 | 3 | 1 | 2 | 2 | 1 | 1 | Male |
| U Illinois | 3 | 3 | 2 | 1 | 1 | 1 | 5 | |
| Iowa St | 3 | 3 | 1 | 1 | 2 | 1 | 1 | |
| Jacksonville | 4 | 4 | 2 | 3 | 3 | 1 | 1 | |
| U Kansas | 3 | 6 | 1 | 1 | 3 | 1 | 3 | |
| Maine Maritime | 1 | 3 | 3 | 2 | 2 | 1 | 2 | Male |
| Marquette | 3 | 4 | 2 | 1 | 3 | 3 | 2 | |
| MIT | 1 | 1 | 1 | 2 | 1 | 2 | 1 | |
| Miami U Ohio | 3 | 4 | 1 | 1 | 1 | 1 | 3 | |
| U Michigan | 3 | 3 | 1 | 1 | 1 | 1 | 2 | |
| U Minnesota | 3 | 4 | 2 | 1 | 1 | 1 | 5 | |

TABLE C-1. NUMERICAL CODES FOR INSTITUTIONAL VARIABLES (continued)

| COLLEGE | GEO | RANK | ENVIR | TYPE | SAL | CONTROL | SIZE | ETHNIC/ COED |
|---|---|---|---|---|---|---|---|---|
| U Mississippi | 4 | 4 | 1 | 1 | 3 | 1 | 2 | |
| U Missouri | 3 | 4 | 1 | 1 | 3 | 1 | 2 | |
| U Nebraska | 3 | 6 | 2 | 1 | 3 | 1 | 5 | |
| U New Mexico | 2 | 5 | 2 | 1 | 3 | 1 | 4 | |
| U N Carolina | 4 | 3 | 1 | 1 | 1 | 1 | 5 | |
| Northwestern | 3 | 2 | 2 | 1 | 1 | 2 | 2 | |
| Notre Dame | 3 | 3 | 1 | 1 | 2 | 3 | 2 | |
| Ohio St. | 3 | 6 | 2 | 1 | 2 | 1 | 5 | |
| U Oklahoma | 2 | 4 | 1 | 1 | 3 | 1 | 4 | |
| Oregon St. | 2 | 4 | 2 | 1 | 3 | 1 | 3 | |
| Penn St. | 1 | 4 | 3 | 1 | 1 | 1 | 2 | |
| U Penn | 1 | 2 | 2 | 1 | 2 | 2 | 3 | |
| Prairie View | 2 | 5 | 3 | 1 | 3 | 1 | 1 | M |
| Purdue | 3 | 4 | 1 | 1 | 1 | 1 | 5 | |
| RPI | 1 | 2 | 2 | 2 | 2 | 2 | 1 | |
| Rice | 2 | 2 | 1 | 1 | 1 | 2 | 2 | |
| U Rochester | 1 | 3 | 2 | 1 | 1 | 2 | 2 | |
| Savannah St. | 4 | 5 | 1 | 3 | 3 | 1 | 1 | M |
| U S Carolina | 4 | 4 | 2 | 1 | 3 | 1 | 4 | |
| USC | 2 | 4 | 1 | 1 | 2 | 2 | 3 | |
| Southern A&M | 4 | 5 | 1 | 1 | 3 | 1 | 2 | M |
| Texas A&M | 2 | 4 | 1 | 1 | 3 | 1 | 3 | |
| Texas | 2 | 4 | 2 | 1 | 2 | 1 | 5 | |
| Tulane | 4 | 3 | 2 | 1 | 3 | 2 | 2 | |

TABLE C-1. NUMERICAL CODES FOR INSTITUTIONAL VARIABLES (continued)

| COLLEGE | GEO | RANK | ENVIR | TYPE | SAL | CONTROL | SIZE | ETHNIC/ COED |
|---|---|---|---|---|---|---|---|---|
| U Utah | 2 | 4 | 2 | 1 | 3 | 1 | 4 | |
| Vanderbilt | 4 | 3 | 2 | 1 | 1 | 2 | 1 | |
| Villanova | 1 | 4 | 1 | 1 | 1 | 3 | 2 | |
| U Virginia | 4 | 2 | 1 | 1 | 1 | 1 | 2 | |
| U Washington | 2 | 3 | 1 | 1 | 2 | 1 | 5 | |
| U Wisconsin | 2 | 3 | 2 | 1 | 1 | 1 | 5 | |
| SUNY Maritime | 1 | 4 | 1 | 2 | 1 | 1 | 1 | Male |
| VMI | 4 | 4 | 1 | 2 | 1 | 1 | 1 | Male |

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